

# Correlation between Oral Hygiene Index-Simplified (OHI-S) and Various Body Mass Index (BMI) Among 6-8 Years Old Children in Bandung City

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**Abstract:** Oral hygiene index (OHI-S) and body mass index (BMI) are two of the most important indexes to determine quantitative factors related to malnutrition and oral hygiene. Aim. The aim of this study is to correlate BMI and OHI-S in 6–8 years of age children in Bandung City. Method. This study was cross sectional with consecutive sample by selecting 211 students of 6-8 years of age from several elementary school in Bandung City. BMI was evaluated by measuring subjects' weights and height. Simplified oral hygiene index (OHI-S) was determined by Green–Vermillion. The data gained was analyzed by using chi-square and its correlation is determined by contingency coefficient. Result. statistical test result shows that  $t\text{-value} (6,793) < t\text{-table} (12,592)$  which means there is no relationship between BMI with OHI-S. The contingency coefficient test gives the result of  $C=0,177$  which is belong to interval of  $0.00 < C < 0.25$  identifying that the correlation between BMI and OHI-S is included in degree of weak association. Conclusion. It can be concluded that there is no clear relationship between oral hygiene index simplified with body mass index among children aged 6-8 years old.

**Keywords:** Oral hygiene index-simplified (OHI-S), body mass index (BMI)

## 1. Introduction

Maintaining and enhancing oral hygiene properly is related to dental plaque control especially plaque's quantitative which can be carried out by determining oral hygiene index-simplified (OHI-S) which is differ from the original oral hygiene index (OHI) in the number of the scored tooth surfaces is that 6 surfaces rather than 12. The OHI-S criteria is as same as those use for OHI comprising of two components which are the debris index and the calculus index representing the amount of debris and calculus found on selected tooth surfaces. The six surfaces examined for the OHI-S are selected from four posterior and two anterior teeth [1], [2]. OHI-S is an index now recognized as equally important in connection to socio-economic status and general health. On the other hand, oral tissues health which is determined by oral hygiene may have a profound impact on the quality of life and can improve general health. Hence, epidemiologic studies may contribute high value in assessing the prevalence of diseases and in analyzing possible factors affecting the disease pattern [2], [3].

Determination of oral hygiene is considered as a high priority in prevention among children because clinically it will have local and individual impacts. The local effects are significantly associated with the decline of the tooth cavity and affect its progressiveness. The individual effects of oral hygiene status may determine caries-affected teeth. The children who gain oral hygiene measurement for their teeth and gum have exhibited smaller number of decayed teeth compare to those who have never been provided it [4]. Furthermore, untreated or improperly treated caries might be followed by complications leading to premature loos of deciduous teeth among children [5]. This condition

may cause alteration of general health status will considerably influence oral hygiene status and vice versa [6]. Many factors influence the relationship between oral health status and general health status such as infections, chronic inflammation, and genetic predisposition that might cause malnutrition [7]. The general health status can be determined through establishing the BMI by measuring body weight and height.

Recently, the role of childhood underweight which is characterized through body mass index (BMI) on later development of oral health has been well documented showing that weight disproportion are strongly related to clinical condition [8], [9]. Oral health condition in children characterized by OHI-S related to BMI is well documented in current literature, therefore revealing the correlation between those factor might be able to improve the overall dental public health strategies and promote oral health habits among children [10]. It could be assumed that an increased or decreased BMI might be potential risk factor for periodontitis which is indicated by the existence of biofilm and debris on teeth surface measured by using OHI-S. connection between BMI and periodontitis has been proven related to unhealthy dietary patterns with insufficient micronutrient for example less sugar and fat content influencing BMI [11]. Recent studies have been conducted reporting a relationship between various BMI and periodontitis in adolescent thus it is thinkable to establish the study investigating the relationship between BMI and periodontal health status represented by OHI-S in children with age of 6 – 8 years old.

## 2. Materials and Methods

The study was a cross-sectional involving 211 children from 6 to 8 years of age as a consecutive sample from elementary school in Bandung City. Oral hygiene condition was assessed by taking the Green-Vermillion simplified oral hygiene index (OHI-S). Oral examination was performed by a single examiner using mouth mirror and community periodontal index of treatment needs (CPITN) probe and the children's parents were asked to fulfill informed consent prior to the examination. The 6 teeth surfaces scored were classified within 3 debris criteria; 0 – No debris or stain present, 1 – Soft debris covering not more than one third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered, 2 – Soft debris covering more than one third, but no more than two third, of the exposed tooth surface and 3 – Soft debris covering more than two thirds of the exposed tooth surface [12].

The BMI was determined through anthropometric measurements. The subjects' weights (kg) were assessed by using digital scale and their height (cm) were established by using a wall mounted measuring device. Body mass index (BMI) is the usual tool in expressing body fat percentile and is calculated by dividing weight by squared height:  $BMI = \text{mass}(\text{kg}) / (\text{height}[\text{m}])^2$  [13]. The data obtained was analyzed using chi-square and the degree of weak association was determined by using contingency coefficient.

### Ethical and legal considerations of the study

The project was approved by Scientific Ethic Committee (No: 979/UN6.C.10/PN/2017), Faculty of Medicine,

Universitas Padjadjaran in Bandung, Indonesia. All of research's subjects were asked to sign an informed consent through their parents to comply with the ethical and legal aspects of the research.

## 3. Result

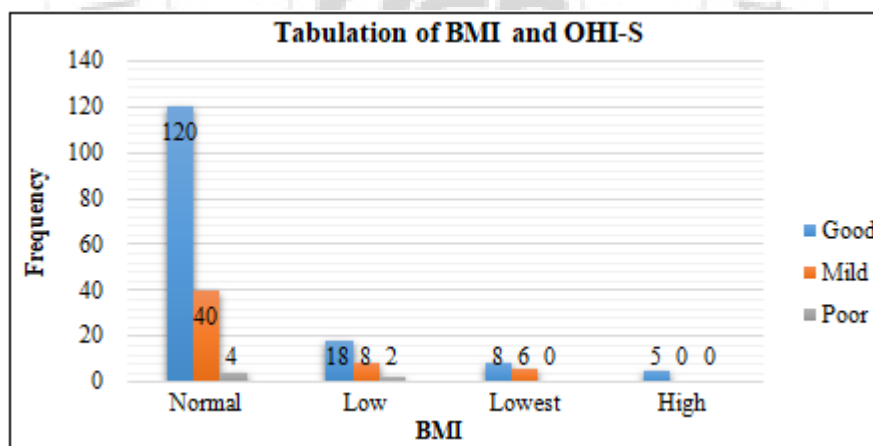
This study involved 211 subjects with age of 6 – 8 elementary school students. From the overall population, 164 students have normal BMI, 42 students are having low BMI and 5 students are having high BMI. The correlation between various criteria of BMI and OHI-S are presented in table and graph below.

**Table 1: Correlation between OHI-S and BMI**

BMI	OHI-S			Total	$\chi^2_{value} = 6,793$
	good	mild	poor		
Normal	f	120	40	4	164
	%	73,2	24,4	2,4	100,0
low	f	18	8	2	28
	%	64,3	28,6	7,1	100,0
lowest	f	8	6	0	14
	%	57,1	42,9	0,0	100,0
high	f	5	0	0	5
	%	100,0	0,0	0,0	100,0
Total	f	151	54	6	211
	%	71,6	25,6	2,8	100,0

**Table 2: statistical analysis result of correlation between OHI-S and BMI**

Correlation	C	t-value	t-table
OHI-S and BMI	0,177	6,793	12,592



**Graph 1: Correlation between BMI and OHI-S**

Based on the table and the graph above, it is showed that 164 subjects who have normal BMI is categorized into 120 respondents possess good OHI-S (73,2%), 40 respondents have a mild OHI-S (24,4%) and those who have poor OHI-S are 4 respondents (2,4%). 28 subjects are included in low BMI comprise of 18 respondents with good OHI-S (64,3%), those who is indicated of having mild OHI-S is 8 respondents (28,6) and 2 respondents (7,1%) have a poor OHI-S. There are 14 subjects included in the lowest BMI grouped into good OHI-S is that 8 respondents (57.1%) and mild OHI-S is 6 respondents (42.9%). All of subjects with high BMI are categorized as having good OHI-S.

The correlation between BMI and OHI-S was determined by chi-square analysis. Based on the statistical calculation, the result of t-value is 6.793. This statistical test result shows that t-value (6,793) < t-table (12,592), that means there is no relationship of BMI with OHI-S. To see how far the relationship between BMI and OHI-S, the contingency coefficient was used. This test gives the result of C= 0,177 which is belong to interval of  $0.00 < C < 0.25$  identifying that the correlation between BMI and OHI-S is included in degree of weak association.

#### 4. Discussion

The oral hygiene status exhibiting periodontal health status is examined and registered according to the WHO by the Green-Vermillion OHI-S. This index is used for estimating the epidemiology based on distribution of biofilm which has been proven as a cause of periodontal diseases, through coloring the teeth. The OHI-S comprise of two components is that plaque index and calculus index which is exactly describes periodontal health status [5]. Present study have stated that poor oral hygiene or periodontal health status that could be signed by OHI-S was associated with the presence of periodontal diseases which is truly have a tight connection with the existence of debris and biofilm. This statement confirms that the quality of oral hygiene is a very important risk factor for progressiveness of periodontal diseases [14]. Study conducted by Kumar regarding the relationship between BMI and periodontal health status of green marble mine laborers in Kesariyajii, India had proven that risk of periodontitis may increase for each escalation in the BMI. Hence, the frequency of periodontal diseases which may have a connection with OHI-S was significantly associated with BMI [7].

There are still many studies had stated that the connection between BMI and periodontal health status is very strong, one of them is the study conducted by Sheiham et al had already proven that periodontal status deteriorates with BMI [15]. On the other hand, Reeves et al conducted a study using subjects with 17-21 years of age for investigating the association of body weight and periodontal disease proven that the body weight significantly influences the periodontal status [11]. Ekuni et al studied the association of BMI and periodontitis and reported that BMI influence risk of periodontitis [16]. Nevertheless, Rathod et al had made a conclusion of their research that there is a negative relation between underweight, normal weight and periodontal health status but the relation between overweight, obesity and periodontal health status is positive [6]. Thus, it can be concluded that BMI seems to have a relationship with periodontal health status represented by OHI-S.

The results of the studies described above appear contradictory to the results of this study which illustrate that there is no relationship between OHI-S and BMI with the degree of interrelations between the two is very weak. This may be possible because BMI categorization were used was different. Some of the above studies established underweight, overweight and obesity groups whereas this study only grouped BMI into normal, low and high regardless BMI as a disruption. It cannot be denied that indeed the relationship between BMI with OHI-S is quite complex. Many factors might influence this relationship, for example age, quality of diet, eating habit and oral hygiene care habit. It can be assumed that the age is the one very important factor influencing the result of this study as according to the study conducted by Miyazaki et al stated that periodontal disease increased with the increase in age [17]. This assumption is estimated because the previous research subjects were adolescents, young adults and adults while the subjects of this study were children aged 6-8 years old where their diet pattern is still simple and the likelihood of calculus index is still low.

#### 5. Conclusion

This research concludes that there is no clear relationship between oral hygiene index simplified with body mass index among children aged 6-8 years old in degree of weak association.

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