

## The Connection between Self-rated Oral Health and the Behavior: ‘The 6th Korea Youth Health Behavior Online Survey’

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### Abstract

*The purpose of this study was to determine if self-rated oral health differed according to self-reported oral health behaviors in Korean adolescents. The raw data of ‘The 6th Youth Health Behavior Online Survey’ carried out by the Korea Center for Disease Control and Prevention were analyzed. Independent t-test, one-way ANOVA, and Logistic regression analysis were used to assess the relationships between oral health behaviors and self-rated oral health (n = 73,238). Oral health behaviors had stronger influence on daily toothbrushing habits. In particular, participants who brushed their teeth in the morning and participants who brushed their teeth more than 3 times a day were more likely to have good self-rated oral (p<.001). Korean adolescents with high self-rated oral health reported practicing good oral health behaviors. These results highlight the need for the further practicable oral health education programs.*

**Keywords:** Korean Adolescents, Perceived oral health, Self-rated oral health, Daily toothbrushing habits, Dental treatment experiences

### 1. Introduction

Oral health standards in Korea have primarily evaluated by depending on objective data [1]. In other words, when oral health policy has established or planed, objective oral health dynamic indicators such as Decayed Missing and Filled Permanent Teeth (DMFT index) or Community Periodontal Index of Treatment Needs (CPITN) have been used [2-3]. However, as the concept regarding ‘health’ is no longer simply defined by the absence or presence of physical diseases but changed into the concept of mental and social well-being [4], we have more interested in the influence of oral diseases on life quality for the assessment about oral health. In that sense, self-rated health has become a key factor to arrange oral health policies for the actual improvement of people’s health and life quality [5-6].

Self-rated health means the objectification about health status [7] perceived internally by selecting one among Excellent, Very Good, Good, Average, or Poor about own health status [8]. This is widely used for the health status evaluation of individual and participants as a self-recording method [7-8]. This health evaluation method is recognized as a way to express the overall health status because the accuracy and credibility is high as individuals might be better perceived their own condition rather than by others, so that is reported as an excellent cost-benefit health assessment method [9-11]. Self-rated health might be a more accurate estimation method about life quality and well-being than a clinical disease assessment conducted by medical workers [12], and used as a dynamic indicator or a treatment need or result indicator regarding the burden for oral diseases. Furthermore, self-rated health is recommended as an essential item for evaluating the collective life quality as well as displayed its excellent estimation ability for defining future health status [13], especially about life and death matters [14].

On condition, the exploration about the relation between self-rated oral health and other factors is important for Korean because it might be represented differently by the unique race and cultural background or the medical care system of countries and impacted by various factors such as socioeconomic or objective oral state factor, and the awareness or behavior about oral health. It is also important to understand about own oral health because self-rated oral health is very closely related to the behavior. Cockerham, *et al.* reported that good evaluation attitude about own health has a great influence for the health improvement behavior in the study utilized health state cognitions rather than clinical inspections [15]. Generally, adults or seniors are used for the study about self-rated health and daily habit. As getting older, people have higher interests about health and sense the necessary about health life. It indicates that they have much higher interests about the necessary about health life habit; especially they have any disease [15-16]. Even though, I believe the study targeted to the youth has more meaning because preventive cares are more effective than treatments after disease occurrence.

Adolescence is an important period to settle the lifelong health because the youth has the greatest changes in mental and physical as a transition period from childhood to adulthood [17], and the oral health behavior formed during that period turns into habits or life modes, which hard to fix, and that influences the affection of chronic disease in the adulthood. Moreover, it is important to put into a practice as well as a good awareness about health because the health belief or life habit formed in that age will be the foundation of their lifelong health and oral health [18]. In this matter, I can say that adolescence period is a factor to settle the oral health and physical health state for a lifelong period as having a correct understanding and good health education [19]. Hence, in this study, I plan to explore an appropriate oral health behavior of the youth fitted with a right cognition about own oral health state by searching the created factors of self-rated oral health and the behavior and then analyzing the relation.

## **2. Study Participants & Methods**

### **2.1. Study Participants**

This Study is conducted based by ‘The 6th Korea Youth Health Behavior Online Survey’ (2010) in the Korea Disease Control and Prevention Center, which is to understand the behavior according to self-rated oral health of the youth in Korea [20]. For this, I submitted a request form and the summary according to the regulation and received the original data through a screening process.

The participants of ‘The 6th Korea Youth Health Behavior Online Survey’ are 73,238 students in 800 junior high and high school samples (400 junior high schools and 400 high schools) based on April in 2009, and the sampling is consisted of a population stratification, a sample classification, and a sample expression step.

In a population stratification step, I classify participants into 135 levels by using 45 districts and grades in schools (junior high schools, general high schools, and special high schools) which are classify 16 cities and towns into big cities, middle and small cities, and town districts by stratification variables as considering the geographical approach, the number of school and population, the environment for living, and the rate of smoking & drinking, *etc.* to minimize the sampling error. In a sample division step, I set the sample size as 400 junior high schools and 400 high schools, and then classify into five groups in the participants of 16 junior high schools and high schools. And I classify into cities, city scales (big cities, middle and small cities, and town districts), and local areas by a proportional distribution method to match the population ratio and the sample ratio, and junior high schools by boys/girls/boys & girls, and general/special schools. I conducted this sampling by two steps. I selected sample schools by a bellwether sampling and then decided study objects in one class of each grade by a random sampling.

## 2.2. Study Method

The content of ‘The 6th Korea Youth Health Behavior Online Survey’ (2010) is produced 96 indicators in 14 areas as smoking, drinking, obesity & weight control, physical activity, eating habit, damage prevention, sexual behaviors, mental health, oral health, atopy & asthma, personal hygiene, internet addiction, drug, and health balance [20-21]. The questionnaires and indicators in each area are based on internal and external recourses and developed by the advisory committee.

In this study I classify 8 variables related to the oral health behavior into personal habit factors of tooth brushing (the practice of tooth brushing, the frequency of tooth brushing, tooth brushing after having lunch at school) and personal dental care experience factors (history of general dental care, sealant, fluoridation, scaling treatment, and oral health education in school) and then analyzed them.

And self-rated oral health is quantified on personal oral health state of teeth or gum at ordinary time by Likert 5 point scales, 1-Very Poor, 2-Poor, 3-Average, 4-Good, 5-Very Good.

## 2.3. Data Analysis

I operated Independent t-test and One-way ANOVA to grasp the relation between self-rated oral health and the practice of tooth brushing & oral health behavior. And I implemented Scheffe’s post-mortem. I classify dependent variables into good or bad of self-rated oral health to figure out the influence factor to oral health behavior by self-rated oral health of the youth, and operated Bivariate logistic regression analysis as 8 independent variables of oral health behavior. To analysis, I use SPSS 12.0 statistical package (SPSS Inc., Chicago, IL, USA) as the significance level 0.05 of a statistical significance test.

## 3. Study Result

### 3.1. The Population-social Characteristics of Participant

The responders are 52.4% boys’ students and 47.6% girls’ students. And there are 17.2% in the 3<sup>rd</sup> graders, 17.1% in the 2<sup>nd</sup> graders, and 17.0% in the 1<sup>st</sup> graders of junior high school. The highest are metropolitan residents as 52.0%.

The youth in Korea answered as ‘Average’ 41.0%, ‘Good’ 26.1%, ‘Poor’ 23.4%, ‘Very Good’ 7.0%, ‘Very Poor’ 2.4% in the question (What do you think about your oral health of the teeth or gum at ordinary time) regarding self-rated oral health in Table 1.

**Table 1. The Population-social Characteristics of Participant**

Variable	Values	Person(%)
Gender	Male	38,391(52.4)
	Female	34,847(47.6)
Grade	Middle school 1st	12,468(17.0)
	Middle school 2nd	12,499(17.1)
	Middle school 3rd	12,603(17.2)
	High school 1st	12,021(16.4)
	High school 2nd	12,124(16.6)
	High school 3rd	11,523(15.7)
Residence type	Metropolis	38,116(52.0)
	City	26,066(35.6)
	Rural area	9,056(12.4)

school type	Co-education	45,892(62.7)
	School of Boys	14,087(19.2)
	School of Girls	13,259(18.1)
Self-rated oral health	Very good	5,011(6.8)
	Good	18,711(25.5)
	Normal	30,254(41.3)
	Bad	17,433(23.8)
	Very bad	1,829(2.5)

### 3.2. The Relation between the Youth Self-rated Oral Health and Personal Daily Habit Factors of Tooth Brushing

In 8 variables related oral health behavior, suggested with the practice of tooth brushing, the daily frequency of tooth brushing, and tooth brushing after lunch at school, the highest response is tooth brushing after breakfast, and self-rated oral health is indicated as 3.23(SD=1.042) in average ( $P<0.001$ ). Tooth brushing going to bed is 77.9%, and no tooth brushing after eating snacks is 77.9%. When tooth brushing is practiced, the level of self-rated oral health is a little bit higher. And when the daily frequency of tooth brushing is more than 3 times, it is indicated as 83.7% and the level of self-rated oral health is better than the frequency is less than 3 times. For tooth brushing after lunch at school, the highest response is 'No tooth brushing' as 40.1%. The self-rated oral health of answered 'Always tooth brushing' participants is relatively higher ( $P<0.001$ ) in Table 2.

**Table 2. The Relation between the Youth Self-rated Oral Health and Personal Daily Habit Factors of Tooth Brushing**

Variable		N (%)	Self-rated oral health	P-value
Toothbrushing in relation to breakfast	Before meal	13,924 (19.0)	3.06 (0.93)	<.001
	After meal	49,415 (67.5)	3.17 (0.92)	
	Eat meal but do not brush teeth	2,599 (3.5)	2.75 (0.93)	
	Do not eat meal and do not brush teeth	1,603 (2.2)	2.70 (0.89)	
	Do not eat meal but brush teeth	5,697 (7.8)	2.94 (0.92)	
Toothbrushing in relation to lunch	Before meal	877 (1.2)	3.36 (1.07)	<.001
	After meal	37,108 (50.7)	3.16 (0.93)	
	Eat meal but do not brush teeth	33,005	3.04 (0.91)	

in relation to lunch		(45.1)		
Toothbrushing in relation to lunch	Do not eat meal and do not brush teeth	1,640 (2.2)	2.95 (0.93)	
Toothbrushing in relation to lunch	Do not eat meal but brush teeth	608 (0.8)	3.16 (0.99)	
Toothbrushing in relation to dinner	Before meal	1,182 (1.6)	3.23 (1.04)	<.001
Toothbrushing in relation to dinner	After meal	62,847 (85.8)	3.13 (0.92)	
Toothbrushing in relation to dinner	Eat meal but do not brush teeth	6,725 (9.2)	2.88 (0.94)	
Toothbrushing in relation to dinner	Do not eat meal and do not brush teeth	1,026 (1.4)	2.83 (0.93)	
Toothbrushing in relation to dinner	Do not eat meal but brush teeth	1,458 (2.0)	2.97 (0.97)	
Toothbrushing before going to bed	Brush teeth	57,052 (77.9)	3.14 (0.92)	<.001
Toothbrushing before going to bed	Do not brush teeth	15,884 (21.7)	2.97 (0.92)	
Toothbrushing before going to bed	N/A	302 (0.4)	2.85 (1.11)	
Toothbrushing after eating snack	Brush teeth	16,438 (22.4)	3.27 (0.94)	<.001
Toothbrushing after eating snack	Do not brush teeth	37,512 (51.2)	3.05 (0.92)	
Toothbrushing after eating snack	N/A	19,288 (26.3)	3.08 (0.92)	
Toothbrushing frequency per day	Less than 3 times	11,939 (16.3)	2.86 (0.92)	<.001
Toothbrushing frequency per day	More than 3 times	61,299 (83.7)	3.15 (0.92)	
Toothbrushing after eating	All the time	21,621 (29.5)	3.18 (0.95)	<.001

lunch at school				
Toothbrushing after eating lunch at school	Most of the time	10,999 (15.0)	3.10 (0.92)	
Toothbrushing after eating lunch at school	Sometimes	11,238 (15.3)	3.08 (0.90)	
Toothbrushing after eating lunch at school	Never	29,380 (40.1)	3.06 (0.92)	

Self-reported oral health values are the mean  $\pm$  standard deviation.

### 3.3. The Relation between the Youth Self-rated Oral Health and Personal Dental Care Experience Factors

In 8 variables related oral health behavior, suggested with the general dental cares, sealants, fluoridations, scaling treatments, and oral health educations in school within the last 12 months as personal dental care experience factors, the highest response is 35.8%. And if the participants has dental cares twice a year, the level of self-rated oral health is the highest as 3.14 (SD=0.901) in average ( $P<0.001$ ). If the participants has a fluoridation experience within the last 12 months, the level of self-rated oral health is higher as 3.14 (SD=0.960) in average ( $P<0.001$ ). The percentage of participant who has oral health educations in school within the last 12 months is only 23.6%. Self-rated oral health is better if any oral health education experiences ( $P<0.001$ ) in Table 3.

**Table 3. The Relation between the Youth Self-rated Oral Health and Personal Dental Care Experience Factors**

Variable		N (%)	Self-rated oral health	P-value
Number of dental treatments in the past 12 months	None	26,234 (35.1)	3.13 (0.94)	<.001
	One	22,703 (31.3)	3.12 (0.90)	
	Two	12,002 (16.7)	3.14 (0.90)	
	Three	4,270 (5.8)	3.06 (0.94)	
	Four or more	8,029 (11.0)	2.95 (0.98)	
Received sealant treatment*	No	27,530 (59.2)	3.15 (0.92)	<.001
	Yes	19,474 (40.8)	3.00 (0.91)	
Received fluoridation treatment *	No	42,085 (90.0)	3.08 (0.91)	<.001
	Yes	4,919 (10.0)	3.14 (0.96)	
Received scaling treatment *	No	33,295 (69.8)	3.10 (0.91)	<.001
	Yes	13,709 (30.2)	3.07 (0.94)	
Received oral health education in school	No	55,954 (78.0)	3.10 (0.93)	<.001
	Yes	17,284 (22.0)	3.13 (0.92)	

Self-reported oral health values the mean  $\pm$  standard deviation.

\*47,004 subjects with dental treatment experience in the last 12 months.

### 3.4. The Relation between the Youth Self-rated Oral Health and Oral Health Behavior

When tooth brushing practiced as a daily habit factor, self-rated oral health is better. Especially, if tooth brushing practiced after breakfast, the level of self-rated oral health is 2.6 times higher than no practice participants ( $P<0.001$ ). And if the frequency of tooth brushing is more than 3 times, the level of self-rated oral health is 2.3 times higher than less than 3 times participants ( $P<0.001$ ). If any oral health education experiences within the last 12 months, the level of self-rated oral health is 1.1 times better than no experience participants ( $P<0.001$ ). Personal daily tooth brushing habits are more closely related to the self-rated oral health than dental care experiences in Table 4.

**Table 4. The Relation between the Youth Self-rated Oral Health and Oral Health Behavior**

Variable	Self-rated oral health		
	Odds ratio	95% confidence interval	P-value
Brush teeth in the morning (N/Y)	2.578	2.363-2.814	<.001
Brush teeth after lunch (N/Y)	1.283	1.234-1.334	<.001
Brush teeth after dinner (N/Y)	1.770	1.662-1.886	<.001
Brush teeth before going to bed (N/Y)	1.516	1.437-1.599	<.001
Brush teeth after eating a snack (N/Y)	1.722	1.638-1.810	<.001
Brush teeth more than 3 times/day (N/Y)	2.311	2.194-2.434	<.001
Brush teeth after eating lunch in school (N/Y)	1.226	1.179-1.274	<.001
Dental treatment in the last 12 months (N/Y)	0.909	0.874-0.946	<.001
Sealant in the last 12 months (N/Y)*	1.000	1.000-1.000	<.001
Oral health education in the last 12 months (N/Y)	1.116	1.067-1.168	<.001

\*47,004 subjects with dental treatment experience in the last 12 months.

## 4. Study Result

State research related oral health is conducted by National Health Interview Survey (NHIS), National Health and Nutrition Examination Survey (NHANES), School Health Policies and Programs Study in USA. And the research about the children and adolescent (age 4-18) is conducted by National Diet and Nutrition Survey in a 10 years' cycle as same as the research for the adults in England, and it is conducted by every 6 years as under the name of 'dental disease state research' in Japan. On the other hand, it is conducted in Korea every 3 years since 2000, but it is only for objective oral health dynamic indicators as CPITN and DMFT index, *etc.* In addition to this, Online Research about Korea Youth Health Behavior Type is conducted included self-rated health since 2005. This study result is able to be generalized because the data is extracted from the representative samples of the whole country and it is conducted by well-trained researchers. The Korean Youth has not practiced proper preventions and management behavior for oral diseases because there is less chance to have a regular checkup or education because of heavy study schedule even though the level of interests is high. To achieve oral health education effectively, we need a strategy to enhance motivations and encourage active participations. Moreover, the important point is the youth needs to aware about own health state and practice the content fitted with the own characteristics.

In the result of analysis, 'Good' or 'Very Good' responses about self-rated oral health of the Korean youth are 33.1% , but under 'Average' responses are 67.8%. In reported cases, under 'Average' responses are 20~50%. In the similar foreign study [22,23], self-rated oral health of the Korean youth has comparatively lower. However, there are needed more specific comparative studies concerning national or sociocultural differentiations about the level of self-rated oral health. The tooth brushing of the Korean youth has practiced after dinner, going to bed, and after breakfast in order, but has no tooth brushing after snakes, lunch, and after lunch at school in order. Related to this, the self-rated oral health of the practice participants is significantly higher compared with no practice participants statistically. Moreover, the participants practiced tooth brushing over 3 times in a day has good self-rated oral health. In the study of Darby & Walsh, there is no specific frequency to prevent plaque formation, but recommended tooth brushing over twice in a day to prevent plaque formation and control bad breathe [24]. In addition to this, more frequent tooth brushings are needed for the smokers, people who are prone to rapid formation of plaque and tartar, or immune system disorder patients rather than the general people. However, I used the frequency in this study because Korean Dental Association believes tooth brushings are needed 3 times a day, even though there are various opinions from the experts. According to the Korea National Oral Health Survey conducted by the Ministry of Health and Welfare in 2010[3], the majority of Koreans have experienced dental caries and researched as the most prevalence disease in 5-17 aged children and youth period. The 22-27% of age 12 youth participants has experienced dental caries, and the DMFT Index is indicated as 2.1, which is higher than OECD countries (0.6 in Denmark, 1.3 in Japan) [25]. We need to find a specific and actual method to lead positive behavior regarding tooth brushing practice of the youth because the basic way to prevent dental caries is tooth brushing [25]. No tooth brushing after lunch at school is 40.1%. The self-rated oral health is 1.2 times higher if tooth brushing has practiced. The percentage of tooth brushing has increased every year, and it is 9.5%p higher than 2007 but still a low level. So schools are required to create the environment with effective facility & equipment for the practice because the youth spends their most time on schools [3].

As the frequency of dental care experiences is increased, self-rated oral health is generally getting better; however, when the frequency is increased to 3-4 times, self-rated oral health is rather getting worse. I assume this is because of being experienced pains during treatments under bad oral health states. Furthermore, only 23.6% of the Korean youth has experienced oral health educations in school. As the previous mention, self-rated oral health is better as same as oral health practice educations if the youth has experienced oral health educations [26]. In other words, it might be interpreted as 'self-rated oral health is good' by practicing oral health behavior through oral health educations. In Broadbent *et al.* study, the adolescent is the transition period to change the belief about oral health, so the youth has a tendency to maintain a sound oral health state as getting older if they have a right belief [27]. As the result, they addressed the best way to form a correct belief about oral health in adolescent is oral health educations. The goal of preventive educations is to aware personal oral health state and put into practice as a health behavior. Therefore, it is confirmed that the program and chance for oral health educations needs to be increased in Korea. Self-rated oral health is more closely related to the personal daily tooth brushing habit factors rather than treatment experience factors as examining the correlation as self-rated oral health and oral health behavior of the Korean youth. Specifically, the participants practiced tooth brushing every morning has 2.6 times better than no tooth brushing participants. The participants practiced tooth brushing has significantly better self-rated oral health statistically compared to no tooth brushing participants [28]. This is indicated self-rated oral health of the youth is very significantly related to tooth brushing habit [29]. Therefore, oral health educations are needed which emphasized on the part to habituate tooth brushing in oral health behaviors. Moreover, in



the practice of tooth brushing, the efficiency is important. Educations about effective and correct tooth brushing should be included in oral health educations and maintained to be habituation as a lifelong tool for the healthy tooth of the youth.

This study is to provide as a basic data to plan and perform the youth oral health educations in the Ministry of Health and Welfare in the future as perceiving the relation of self-rated oral health and oral health behavior of the Korean youth through 'The 6th Korea Youth Health Behavior Online Survey' (2010) of the Korea Disease Control and Prevention Center having a representative nature. However, self-rated oral health has no subjective entity but only the sense about oral health state, a mere emotional response, so it is hard to be used as an objective indicator fully [29]. I think that identification and consideration about the variables of self-rated oral health is needed in the follow-up study because self-rated oral health is influenced by social or environmental factors as well as personal actual oral states.

## 5. Result

To explore the appropriate oral health behavior fitted with a personal oral health state by analyzing the relation between self-rated oral health and oral health behavior, this study is conducted by 'The 6th Korea Youth Health Behavior Online Survey' (2010) and the result is as follows:

1. For self-rated oral health, 'Good' or 'Very Good' response is 33.1%, and 'Average' or 'Under Average' response is 67.8%.
2. Self-rated oral health and personal daily tooth brushing habit factor had a significant relation statistically, and self-rated oral health is better as practicing tooth brushing.
3. Self-rated oral health and personal dental care experience factor had a significant relation statistically, and self-rated oral health is better if having oral health education experiences than no education participants.
4. If practicing tooth brushing every morning, self-rated oral health is 2.6 better than no practicing participants; and if the frequency of daily tooth brushing is more than 3 times, self-rated oral health is 2.3 better than less than 3 times daily tooth brushing participants.
5. Personal daily tooth brushing habit factor is more strongly related to self-rated oral health than personal treatment experience factor.

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