



Original Article

Factors related to oral health and subjective health among Korean adolescents : the 18th Korea Youth Risk Behavior Survey (KYRBS)

Se-In Ryu¹, Sun-A Lim²

¹Department of Nursing, Songwon University

²Department of Dental Hygiene, Songwon University

Corresponding Author: Sun-A Lim, Department of Dental Hygiene, Songwon University, 73 Songam-ro, Nam-gu, Gwangju-si, 61756, Korea. Tel: +82-62-360-5791, Fax: +82-62-360-5962, E-mail: givesuna@nate.com

ABSTRACT

Objectives: This study was conducted to investigate factors related to oral health and subjective health in Korean adolescents, a total of 51,850 people. **Methods:** Subjective health by general characteristics, subjective health by oral health characteristics, and subjective health by oral health symptoms were analyzed by a cross-analysis. Factors influencing subjective health were analyzed using multiple regression analysis. **Results:** As a factor influencing subjective health, the number of times teeth were brushed 0.62 times lower ($p<0.001$) for 0 times, and 0.91 times lower ($p<0.05$) for 1-2 times. The risk was 1.33 times higher ($p<0.001$) if teeth were brushed before going to bed, and 1.10 times higher ($p<0.05$) if an interdental brush was used. In cases where oral health education was not received, subjective health was 0.86 times lower ($p<0.001$). In cases where there was no pain subjective health was 1.44 times higher ($p<0.001$), gingival bleeding was 1.51 times higher ($p<0.001$), or malodor was 1.53 times higher ($p<0.001$). **Conclusions:** Based on the above results, the relationship between oral health and subjective health was confirmed, and it is thought that opportunities to develop preventive programs to promote youth health should be expanded.

Key Words: Adolescents, Korea Youth Risk Behavior Survey, Oral health, Subjective health

Introduction

Adolescence is a critical period characterized by the development of self-identity, during which individuals not only experience emotional and social conflicts but also rapid physical changes [1]. It is also during this time that adolescents begin to form perceptions about health, and lifestyle habits related to nutrition, physical activity, smoking, and alcohol consumption are established; thus, health-related perceptions and habits established in adolescence may have lasting effects into adulthood [2]. Therefore, health behaviors during adolescence are particularly important [3], and awareness and practice of proper oral health behaviors during infancy, school age, and adolescence are crucial [4].

According to the Korea Youth Risk Behavior Survey (KYRBS), the prevalence of tooth brushing after lunch at school decreased from 22.6% in 2021 to 18.1% in 2022. While the overall prevalence of tooth pain was 40.7%, it was higher among high school students at 42.1% and middle school students at 39.5% [5].

The prevalence of the three major oral diseases in adolescents-dental caries, periodontal disease, and malocclusion-was higher among high school students than middle school students [6]. This may be attributed to the increased stress from academic pressures and social conflicts experienced by high school students, leading to increased consumption of sugar-containing snacks

and neglect of oral hygiene, thus resulting in a higher incidence of oral diseases compared to middle school students [7]. Oral health behaviors during adolescence significantly influence oral health-related quality of life throughout the lifespan. However, adolescents often face challenges in practicing proper oral health behaviors due to their circumstances. Therefore, emphasizing the role of subjective health perception is crucial, as it is a key factor in achieving a healthy quality of life and promoting positive attitudes and behaviors related to oral health among adolescents [8].

Subjective health perception refers to an individual's self-evaluation of their health status, which can be measured either through clinical examination or self-assessment [9]. It is also closely associated with daily lifestyle factors, such as physical activity, alcohol consumption, smoking, and sleep deprivation, rendering it a valid indicator for assessing overall health [10]. Previous studies have reported that positive subjective health perception promotes healthy behaviors [11-13], suggesting that understanding adolescents' subjective oral health perception could help in promoting and maintaining their oral health.

Previous Korean studies on oral health and subjective health using national-level indicators include a study on adolescents' subjective oral health perception and oral health status based on data from 2012 [12] and a study on subjective oral health perception and behaviors based on data from 2015 [13]. Therefore, conducting a follow-up study using the most recent adolescent health behavior data published annually is warranted.

Therefore, this study aimed to identify the factors related to oral health and subjective health of Korean adolescents using the KYRBS data and provide foundational data to develop programs promoting adolescent oral health.

Methods

1. Participants

The study used raw data from the 18th (2022) KYRBS. Government-approved statistical surveys (Approval no.: 117058) have been performed annually since 2005, and the raw data were obtained on request. The study selected 400 middle schools and 400 high schools and randomly chose one class per school. In total, 51,850 students (92.2%) who participated in the 2022 KYRBS were selected as the final study population.

2. Measurements

Subjective health, the dependent variable in this study, was measured using the question, "How do you rate your usual health status?" Responses of 'very healthy,' 'healthy,' and 'average' were categorized as 'healthy,' while responses of 'unhealthy' and 'very unhealthy' were categorized as 'unhealthy.' Independent variables included general characteristics, oral health characteristics, and oral health symptoms. General characteristics consisted of eight items: sex, education grade, stress, economic status, academic performance, alcohol consumption, and smoking. Gender was categorized as 'male' or 'female,' education grade as 'middle school' or 'high school,' and academic performance and economic status as 'high,' 'middle,' or 'low.' Alcohol consumption and smoking were categorized as 'yes' or 'no.' Oral health characteristics included the frequency of brushing teeth on the previous day, categorized as '0 times,' '1-2 times,' or '3 or more times.' Tooth brushing before bed was categorized as 'yes' or 'no,' and tooth brushing after lunch at school was categorized as 'always,' 'mostly,' 'sometimes,' or 'never.' Responses regarding the use of floss, interdental brushes, mouthwash, and electric toothbrush and receiving sealant treatment, scaling, and oral health education were categorized as 'yes' or 'no.'

3. Data analysis

Data were analyzed using the IBM SPSS program (ver. 21.0; IBM Corp., Armonk, NY, USA) and the dataset was constructed using strata (Kstrata), primary sampling units (Psu), and weights (W). Cross-tabulation (complex simple chi-square test) was conducted to analyze subjective health in relation to the general characteristics, oral health characteristics, and oral health symptoms. The predictors of subjective health were analyzed using multiple logistic regression, with a significance level of 0.05.

Results

1. Subjective health according to general characteristics

In terms of general characteristics, the subjective health was better among male students than female students and among middle school students than high school students ($p<0.001$). Furthermore, subjective health perception was better among those with no stress, high economic status, middle/average academic performance, and no alcohol consumption or smoking ($p<0.001$) <Table 1>.

Table 1. Subjective health by general characteristics

Unit: Unweight N(Weight %)

Characteristics	Division	N(%)	Subjective health		p^*
			No	Yes	
Gender	Male	26,397(51.6)	2,469(9.4)	23,928(90.6)	<0.001
	Female	25,453(48.4)	2,936(11.8)	22,517(88.2)	
Education grade	Middle school	28,015(51.6)	2,397(8.6)	25,618(91.4)	<0.001
	High school	23,835(48.4)	3,008(12.6)	20,827(87.4)	
Stress	No	8,813(16.8)	311(3.6)	8,502(96.4)	<0.001
	Yes	43,037(83.2)	5,094(12.0)	37,943(81.9)	
Economic status	High	21,888(43.3)	1,846(8.7)	20,042(91.3)	<0.001
	Middle	24,143(46.0)	2,457(10.4)	21,686(89.6)	
	Low	5,816(10.7)	1,102(19.0)	4,714(81.0)	
Academic performance	High	20,051(38.8)	1,808(9.0)	18,243(91.0)	<0.001
	Middle	15,484(30.0)	1,331(8.9)	14,153(91.1)	
	Low	16,313(31.2)	2,266(14.1)	16,313(31.2)	
Alcohol consumption	No	34,235(65.8)	3,193(9.4)	31,042(90.6)	<0.001
	Yes	17,615(34.2)	2,212(12.8)	15,403(87.2)	
Smoking	No	47,305(91.1)	4,785(10.3)	42,520(89.7)	<0.001
	Yes	4,545(8.9)	620(13.7)	3,925(86.3)	

*by complex sample chi-square test

2. Subjective health according to oral health characteristics

In relation to oral health characteristics, students who brushed their teeth more than three times per day ($p<0.001$), brushed their teeth before bed ($p<0.001$), used dental floss ($p<0.05$), and used interdental brushes ($p<0.01$) reported better subjective health perception. Additionally, students who had not undergone dental sealant or scaling ($p<0.01$) and those who had received oral health education ($p<0.001$) reported better subjective health perception <Table 2>.

Table 2. Subjective health by oral health characteristics

Unit: Unweight N(Weight %)

Characteristics	Division	N(%)	Subjective health		<i>p</i> [*]
			No	Yes	
Tooth brushing / yesterday	0	743(1.4)	166(22.9)	577(77.1)	<0.001
	1-2	31,880(61.6)	3,445(11.0)	28,435(89.0)	
	≥3	19,227(37.0)	1,794(9.4)	17,433(90.6)	
Brushing your teeth before going to bed	Yes	45,367(88.9)	4,364(9.8)	41,003(90.2)	<0.001
	No	5,956(11.1)	924(15.8)	5,032(84.2)	
Tooth brushing after lunch	Always	5,696(10.5)	610(10.9)	5,086(89.1)	0.418
	Mostly	4,201(7.6)	443(10.3)	3,758(89.7)	
	Sometimes	7,527(14.0)	732(10.0)	6,795(90.0)	
	Never	34,426(67.9)	3,620(10.7)	30,806(89.3)	
Dental floss	No	40,125(76.8)	4,268(10.7)	35,857(89.3)	0.031
	Yes	11,725(23.2)	1,137(10.0)	10,588(90.0)	
Interdental brush	No	41,546(80.0)	4,450(10.8)	37,096(89.2)	0.001
	Yes	10,304(20.0)	955(9.5)	9,349(90.5)	
Mouth rinse	No	39,083(74.8)	4,139(10.7)	34,944(89.3)	0.127
	Yes	12,767(25.2)	1,266(10.2)	11,501(89.8)	
Electric tooth brush	No	47,896(92.2)	4,995(10.6)	42,901(89.4)	0.938
	Yes	3,954(7.8)	410(10.5)	3,544(89.5)	
Sealant / ≤1 year	No	38,488(73.9)	3,923(10.3)	34,565(89.7)	0.003
	Yes	13,362(26.1)	1,482(11.3)	11,880(88.7)	
Scaling / ≤1 year	No	35,945(68.3)	3,620(10.2)	32,325(89.8)	0.001
	Yes	15,905(31.7)	1,785(11.2)	14,120(88.8)	
Oral health education	No	377,731(73.9)	4,147(11.1)	33,584(88.9)	<0.001
	Yes	14,119(26.1)	1,258(9.0)	12,861(91.0)	

^{*}by complex sample chi-square test

3. Subjective health according to oral health symptoms

Students without tooth fractures, tooth pain, gingival bleeding, or bad breath reported better subjective health perception ($p < 0.001$) <Table 3>.

Table 3. Subjective health by oral health symptoms

Unit: Unweight N(Weight %)

Characteristics	Division	N(%)	Subjective health		<i>p</i> [*]
			No	Yes	
Tooth fractures	No	47,290(91.3)	4,825(10.4)	42,465(89.6)	<0.001
	Yes	4,560(8.7)	580(12.6)	3,980(87.4)	
Tooth pain	No	34,841(67.0)	2,920(8.5)	31,921(91.5)	<0.001
	Yes	17,009(33.0)	2,485(14.7)	14,524(85.3)	
Gingival bleeding	No	42,345(81.5)	3,828(9.2)	38,517(90.8)	<0.001
	Yes	9,505(18.5)	1,577(16.5)	7,928(83.5)	
Bad breath	No	40,407(77.8)	3,520(8.9)	36,887(91.1)	<0.001
	Yes	11,443(22.2)	1,885(16.6)	9,558(83.4)	

^{*}by complex sample chi-square test

4. Predictors of subjective health

Compared to students who brushed their teeth 3 times per day, those who brushed 0 times per day had 0.62 times the odds ($p<0.001$) and those who brushed 1–2 times per day had 0.91 times the odds of reporting poor subjective health perception ($p<0.05$). Students who brushed their teeth before bed had 1.33 times the odds ($p<0.001$) and those who used interdental brushes had 1.10 times the odds of reporting better subjective health perception ($p<0.05$). Students who did not receive oral health education had 0.86 times the odds of reporting poor subjective health perception ($p<0.001$). Additionally, students without tooth pain had 1.44 times the odds ($p<0.001$), those without gingival bleeding had 1.51 times the odds ($p<0.001$), and those without bad breath had 1.53 times the odds ($p<0.001$) of reporting better subjective health perception <Table 4>.

Table 4. Factors affecting subjective health

Characteristics	Division	Subjective health		<i>p</i> [*]
		OR	95% CI	
Tooth brushing (ref.= ≥ 3)	0	0.62	0.49-0.80	<0.001
	1-2	0.91	0.85-0.98	0.014
Brushing your teeth before going to bed (ref.= no)	Yes	1.33	1.21-1.47	<0.001
Dental floss (ref.= no)	Yes	1.02	0.94-1.10	0.661
Interdental brush (ref.= no)	Yes	1.10	1.01-1.20	0.025
Sealant (ref.= no)	Yes	1.05	0.97-1.13	0.231
Scaling (ref.= no)	Yes	1.03	0.96-1.11	0.372
Oral health education (ref.= yes)	No	0.86	0.79-0.93	<0.001
Fracture teeth (ref.= yes)	No	0.93	0.84-1.04	0.185
Pain (ref.= yes)	No	1.44	1.34-1.55	<0.001
Gingival bleeding (ref.= yes)	No	1.51	1.40-1.62	<0.001
Bad breath (ref.= yes)	No	1.54	1.43-1.65	<0.001

*Multiple logistic regression analysis adjusted for characteristics of the participants (sex, school, stress, economic status, academic performance, drinking, and smoking).

CI: Confidence interval; OR: Odds ratio; ref: reference

Discussion

Oral health significantly influences overall health and has become a key factor in improving the quality of life. Oral health is especially important in adolescence as it affects the growth and development. Moreover, because healthy oral hygiene habits developed during this period serve as foundational behaviors for lifelong oral health maintenance, it is crucial to pay attention to adolescents' oral health [14,15]. Therefore, this study aimed to explore the factors influencing adolescents' oral health and subjective health using the KYRBS data.

Subjective health perception was better among female students compared to male students and higher among middle school students compared to high school students. Students with a high economic status and average academic performance and those who did not drink alcohol or smoke exhibited better subjective health perception. Similarly, Kim and Hyun [3] found that subjective health perception was better among female students than male students, among middle school students than high school students, and among those with a high economic status. Choi [16] also noted that lower economic status and academic performance were associated with poor health and that smoking and alcohol consumption (≤ 7 days) correlated significantly with subjective health. These findings suggest that socioeconomic status can lead to health disparities, highlighting the need for public health interventions such as expanding public healthcare services, enhancing health insurance for economically vulnerable groups, and providing preventive services.

In terms of oral health characteristics, adolescents with better subjective health perception tended to brush their teeth more than three times per day and brush before bed. Similarly, Seong and Lee [13] reported that those who brushed their teeth three or more times per day had better oral health. Based on this finding, they emphasized the need for oral health education to maintain a healthy oral state. Adolescents frequently consume sugary snacks and drinks, which increases the risk of dental caries, underscoring the need to reinforce tooth brushing practices and emphasize the importance of oral disease prevention [17]. Providing opportunities for continuous oral health education and motivation to change oral health knowledge and attitudes among adolescents is essential. Adolescents who used dental floss and interdental brushes reported better subjective health perception. Lee and Lee [18] found that middle school students used floss and interdental brushes more frequently than high school students. Therefore, it is necessary to educate adolescents on choosing the right oral care products for their individual oral conditions and provide direct demonstrations regarding their proper use. Adolescents who had not undergone dental sealant treatment or scaling reported better subjective health perception. Oh [19] noted that dental sealants, which prevent occlusal surface caries, are typically applied during school age and that adolescents often lack awareness about scaling. Park and Lee [20] found that gingival bleeding was more common among high school students than middle school students and that oral health deteriorated as students progressed to higher education grades. These findings highlight the need for education on the importance of scaling from an oral disease prevention perspective.

Subjective health perception was better among those who received oral health education. Previous studies have shown that middle school students are more likely to have received oral health education than high school students [13,21]. Hence, there is a need to strengthen oral health education for high school students [13]. Although they face more time constraints due to academic demands, providing opportunities for oral health education is essential to empower students to manage their health independently.

Regarding oral health symptoms, subjective health perception was better when students did not experience tooth fractures, tooth pain, gingival bleeding, or bad breath. Similarly, Oh [19] reported that better subjective health perception was significantly associated with the absence of tooth fracture, tooth pain, gingival bleeding, and bad breath. Since adolescents spend most of their day at school, it is important to develop and implement oral health education programs tailored to their needs and understanding.

The predictors of subjective health included the frequency of brushing teeth on the previous day, tooth brushing before bed, using interdental brushes, receiving oral health education, tooth pain, gingival bleeding, and bad breath. The findings suggest a positive correlation between better subjective health perception and better oral health management. Good oral health behaviors established during adolescence are important determinants of oral and physical health throughout life [22].

The study limitations include the use of the 18th (2022) KYRBS that followed a cross-sectional design, rendering the data largely subjective and hindering causal inferences. Future studies should consider using objective instruments or professionally examined oral health status to conduct a more comprehensive research. Despite these limitations, the use of data from the nationally representative KYRBS provides relevant foundational data to develop policies aimed at promoting adolescent health and oral health education programs.

Conclusions

This study analyzed data from the 18th (2022) KYRBS to examine the relationship between oral health and subjective health among 51,850 Korean adolescents. The results were as follows:

1. Subjective health perception was better among male students compared to female students and among middle school students compared to high school students ($p<0.001$). Subjective health perception was also better among students with no stress, a high economic status, average academic performance, and no history of alcohol consumption or smoking ($p<0.001$).
2. Regarding the predictors of subjective health, those who brushed their teeth 0 times the previous day had 0.62 times the odds ($p<0.001$) and those who brushed 1–2 times had 0.91 times the odds of poor subjective health perception compared to those who brushed their teeth 3 times ($p<0.05$). Those who brushed their teeth before bed had 1.33 times the odds ($p<0.001$) and those who

used interdental brushes had 1.10 times the odds ($p<0.05$) of reporting better subjective health perception. Students who did not receive oral health education had 0.86 times the odds of reporting poor subjective health perception. The absence of tooth pain was associated with 1.44 times the odds ($p<0.001$), absence of gingival bleeding with 1.51 times the odds ($p<0.001$), and absence of bad breath with 1.53 times the odds of reporting better subjective health perception ($p<0.001$).

These findings confirm the relationship between oral health and subjective health and highlight the importance of developing and implementing health promotion and disease prevention programs for adolescents.

Notes

Author Contributions

Conceptualization: SA Lim, SI Ryu; Data collection: SA Lim, SI Ryu; Formal analysis: SA Lim, SI Ryu; Writing-original draft: SA Lim, SI Ryu; Writing-review&editing: SA Lim, SI Ryu

Conflicts of Interest

The authors declare no conflicts of interest.

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Ethical Statement

None.

Data availability

Data can be obtained from the corresponding author.

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한국 청소년의 구강건강과 주관적 건강 관련 요인 : 제18차 청소년건강행태조사를 바탕으로

초록

연구목적: 본 연구는 51,850명을 대상으로 한국 청소년의 구강건강과 주관적 건강의 관련 요인 알아보기 위하여 실시하였다. **연구방법:** 일반적인 특성에 따른 주관적 건강, 구강건강특성에 따른 주관적 건강, 구강건강증상에 따른 주관적 건강은 교차분석(Complex simple chi-square test)을 실시하였다. 주관적 건강에 미치는 영향요인은 복합표본 로지스틱회귀분석(Multiple regression analysis)로 분석 하였다. **연구결과:** 주관적 건강에 미치는 영향요인으로서는 어제 하루 칫솔질 횟수는 0회 0.62배($p<0.001$), 1-2회는 0.91배($p<0.05$) 낮게 나타났다. 잠자기 전 칫솔질을 하는 경우 1.33배($p<0.001$), 치간칫솔 사용하는 경우 1.10배($p<0.05$) 높게 나타났다. 구강보건교육을 받지 않은 경우 주관적 건강은 0.86배 낮았다. 치아아픔 1.44배($p<0.001$), 잇몸출혈 1.51배($p<0.001$), 구취 1.53배($p<0.001$) 모두 없는 경우 주관적 건강은 높게 나타났다. **결론:** 구강건강과 주관적 건강의 관련성을 확인하였고, 청소년 건강증진을 예방프로그램을 개발하여 교육할 수 있는 기회를 확대해야 할 것으로 사료된다.

색인: 청소년, 청소년건강행태조사, 구강건강, 주관적 건강