JTS

The Journal of Transdisciplinary Studies, 6(3): 307-318, 2022
https://doi.org/10.22685/JTS.2022.6.3.307

The Relationship Between the Chewing Problem, Speaking Problem, and the Mental Health

Ga-Hyun Lee[1], Yu-Seop Shin[1], Jae-Hyun Kim[1]

[1]Department of Health Administration, College of Health Science, Dankook University, Cheonan, Korea, Institute for Digital Life Convergence, Dankook university, Cheonan, Republic of Korea (jaehyun@dankook.ac.kr), Corresponding Author

ARTICLE INFO

Article history:
Received 16 June 2022
Revised 30 September 2022
Accepted 06 October 2022

Keywords:
Oral Problem,
Chewing Problem,
Speaking Problem,
Mental Health

ABSTRACT

The purpose of this study is to provide the basic policy and institutional data for improving the people's mental health and alleviating mental health through their oral health improvement by analyzing how the oral problems affect their mental health among the adults aged 19 or older. This study was conducted among the adults aged 19 or older who participated in the first and second surveys of the 7th National Health and Nutrition Survey. In order to accurately analyze the data by maintaining the circular sampling design method using the National Health and Nutrition Survey, the complex sampling method was applied by applying the individual weights using the distribution estimation layer of the colony extraction variable, and the chi-square analysis and the multiple logistic regression analysis were performed. It turned out that the more discomfort one feels with chewing and speaking problems, the more it affects one's mental health. Furthermore, the higher the level of discomfort in the chewing and speaking problems, the higher the extent of stress perception and suicidal ideation according to the oral problem. In order to prevent deterioration of mental health, and if the oral health improvement policy is provided to the group who are perceived as having the chewing problem and speaking problem to prevent the further deterioration of oral health, it would be possible to alleviate mental health, especially the suicidal ideation and perceived stress.

1. Introduction

In the modern society, the interest in mental health has increased, and the extent of stress and suicide has also increased. The Koreans have the highest level of stress within the OECD and have recorded the highest rate of perceived stress compared to the other developed countries (Kim

et al., 2012, p. 1). According to the statistics of the Korea Respect for Life and Hope Foundation, the average suicide rate in the OECD in the recent year (2017) was 11.2 people, yet the average suicide rate in Korea was 23 people, ranking first in the OECD for the suicide rate. Stress is the main cause of modern diseases, the root of all diseases (Lee, 1999, p. 726), and suicide as well as stress is a serious medical and social problem in Korea (Ahn, 2012, p. 321). These mental health problems can ultimately cause mental illness, and since mental illness is a disease with a very high prevalence, and at the same time, the socioeconomic cost of mental illness is high (Ministry of Health and Welfare, 2011), and hence, mental health is a problem that requires much attention because it can negatively affect the people's quality of life.

Given such problems, the studies on oral health among the various factors that worsen mental health are actively conducted (Park, 2013), and the oral health for individuals not only contributes to the well-being of life, but also improves the mental health and the quality of life. It is considered as a basic factor for maintaining quality and maintaining a healthy life (Kim, 2014). In particular, according to a previous study by Park (2014, pp. 182-18), the more uncomfortable the chewing and speaking problems, the higher the extent of stress and suicide. This suggests that the chewing and speaking problems are the important variables for the mental health problems. Furthermore, according to the research result of Son et al. (2010, pp. 141-151), who examined the relationship between the mental health status and the quality of life, the chewing and speaking problems declined as the quality of life significantly decreased as the mental health status worsened, and including which, the oral problems adversely affect the mental health, and the mental health is directly related to determining the quality of life.

Given these reasons, the mental health and oral health projects are implemented for the mentally ill patients or for the prevention of mental illness for the mentally ill patients and groups at the risk of mental health deterioration. (Son et al., 2010; Nam et al., 2006) The mental health and oral health projects are not only among the various projects to improve the quality of life of the people, but according to a previous study in Korea, it was claimed that the writing and speaking problems cause the mental health to deteriorate since they affect the body as a whole, such as not chewing and swallowing (Kim, 2018).

Hence, this study seeks to analyze the effects of oral health problems such as the chewing problem and speaking problem on the mental health using the data from the 7th period of the National Health and Nutrition Survey, and provide the basic data for enacting the policies and institutional measures.

2. Research Method

2.1 Research data and research subjects

The study used data from the 7th National Nutrition and Health Survey. The sampling frame used the most recent available population and housing census data at the time of designing the sample, and based on which, the representative samples were extracted with the target population of the Koreans aged 1 or older. For sampling, the two-step stratified colony sampling method was

performed using the survey district as the primary and household as the secondary extraction unit, while the municipal, dong, eup, myeon, and housing type were based to stratify the extraction framework, and based on the internalized stratification criteria, the residential area ratio and the head of household's academic background ratio were used. There were 192 survey districts, and 23 sample households were selected using the systematic sampling method among households excluding facilities such as the military, prison, nursing homes, and foreign households within the sample survey district. was selected. According to Article 2 Paragraph 1 of the Bioethics and Safety Act and Article 2, Paragraph 2, Paragraph 1 of the Enforcement Regulations of the Bioethics and Safety Act in 2016 and 2017, this survey data corresponds to the research conducted directly by the government for public welfare, and disease, and according to the opinion of the Research Ethics Review Committee of the Management Headquarters, the research was conducted without reviewing the research ethics, and 26,675 people of the opposite sex aged 19 years or older were analyzed using the data from a health survey and examination as final research subjects.

2.2 Independent variable

According to a previous study, the chewing problem and speaking problem are the typical symptoms caused by the deterioration of oral health, and hence, in this study, two items, "chewing problem" and "speaking problem," were designated as the independent variables in order to understand the effect on mental health according to the degree of discomfort in oral conditions (Yim et al., 2020).

The chewing problem was classified into the five categories of "very uncomfortable", "discomfort", "slightly uncomfortable", "not uncomfortable" and "not uncomfortable at all". The speaking problem was classified into the five categories of "very uncomfortable", "inconvenient", "slightly uncomfortable", "not uncomfortable" and "not uncomfortable at all" as in the above.

2.3 Dependent variable

In order to understand the extent of mental problems caused by oral conditions, two items, "thoughts of suicide" and "stress perception," were designated as dependent variables. The suicidal ideation was classified into the two responses of "yes" and "no" to the question "Have you ever thought of suicide due to an oral problem?" The stress perception was classified into the two categories of "feeling less" and "feeling a lot".

2.4 Correction variables

As the sociostatistical factor variables in this study, the pre-defined data such as 'gender', 'age', 'income', 'education', and 'marital status' were selected as the variables. Gender was classified into 'male' and 'female', and age was '29 years or younger', '30-39', '40-49', '50-59', '60-69', and '70 or older' based on the previous domestic studies (Son et al., 2021). Income was classified into 'low', 'low-middle', 'middle-high', and 'high', while education was classified into 'below elementary school', 'middle school', 'high school', and 'four year college or higher'. Marital status was

defined as ‘married’ and ‘unmarried’.

As for the health behavior factor variables, ‘subjective health status’, ‘experience of drinking’, ‘whether smoking’, ‘number of walking days per week’, ‘use of dental clinics’, and ‘number of oral health products used’ were selected. The subjective health status was classified into ‘good’, ‘normal’, and ‘bad’, and smoking was classified into ‘current smoker’, ‘past smoker’ and ‘non-smoker’ due to the absence or presence of the drinking experience. The number of walking days per week was classified into ‘never’, ‘1-2’, ‘3-4’, ‘5-6’ and ‘everyday’, while the number of oral health products used was classified into ‘0’, ‘1-2’ and ‘3 or more’.

2.5 Analytical method

The chi-square (X2) test and the multiple logistic regression analysis were performed to determine the relationship between the chewing and speaking problems and the mental health. As for the arrangement and statistical analysis of the collected data, the SAS ver. 9.4 (SAS Institute Inc., Cary, NC, USA) was used, and the significance level (α) of all analyses was less than 0.05.

3. Result

Table 1 is a table which illustrates the general characteristics of the participants. A total of 26,675 participants were in this study, 1,520 (4.4%) of the participants complained of very uncomfortable chewing problem, of whom 924 (59.3%) responded that they felt less stress, and 596 (40.7%) responded that they are under a lot of stress. Furthermore, among 1,520 people, 143 people (9.5%) responded ‘yes’ to whether they thought of suicidal ideation, and to the contrary, a total of 1,377 people (90.5%) responded ‘no’ to whether they thought of suicidal ideation.

Table 1. Whether one has thoughts about suicide and the extent of perception of stress according to general characteristics

	Extent of the perception of stress									Whether one has had the thought of suicide						
	Total			Felt little			Felt much				Yes			No			
	N	%	%*	N	%	%*	N	%	%*	P-value	N	%	%*	N	%	%*	P-value
Chewing problem										<.0001							<.0001
Very uncomfortable	1,520	5.7	4.4	924	60.8	59.3	596	39.2	40.7		143	9.4	9.5	1,377	90.6	90.5	
Uncomfortable	4,811	18.0	15.7	3,468	72.1	69.9	1,343	27.9	30.1		228	4.7	4.5	4,583	95.3	95.5	
Moderate	4,511	16.9	16.5	3,280	72.7	70.4	1,231	27.3	29.6		140	3.1	3.1	4,371	96.9	96.9	
Not uncomfortable	6,249	23.4	24.0	4,746	76.0	73.9	1,503	24.1	26.1		131	2.1	2.1	6,118	97.9	97.9	
Not uncomfortable at all	9,584	35.9	39.5	7,421	77.4	75.9	2,163	22.6	24.1		185	1.9	1.9	9,399	98.1	98.1	
Speaking problem										<.0001							<.0001
Very uncomfortable	509	1.9	1.4	293	57.6	59.3	216	42.4	40.7		59	11.6	12.4	450	88.4	87.6	
Uncomfortable	2,071	7.8	6.3	1,447	69.9	66.9	624	30.1	33.1		129	6.2	5.5	1,942	93.8	94.5	
Moderate	2,928	11.0	9.7	2,161	73.8	71.8	767	26.2	28.2		142	4.9	4.8	2,786	95.2	95.2	
Not uncomfortable	4,886	18.3	17.7	3,612	73.9	72.1	1,274	26.1	27.9		156	3.2	3.1	4,730	96.8	96.9	
Not uncomfortable at all	16,281	61.0	64.8	12,326	75.7	74.1	3,955	24.3	25.9		341	2.1	2.1	15,940	97.9	97.9	
Items used for oral health (count)										0.010							0.013
0	13,033	48.9	47.6	9,780	75.0	73.4	3,253	25.0	26.6		460	3.5	3.2	12,573	96.5	96.8	
1-2	12,654	47.4	48.4	9,362	74.0	72.6	3,292	26.0	27.4		345	2.7	2.7	12,309	97.3	97.3	
3 or more	988	3.7	3.9	697	70.6	68.4	291	29.5	31.6		22	2.2	1.8	966	97.8	98.2	

	Extent of the perception of stress										Whether one has had the thought of suicide						
	Total			Felt little			Felt much				Yes			No			
	N	%	%*	N	%	%*	N	%	%*	P-value	N	%	%*	N	%	%*	P-value
Whether used dental hospital or clinic										0.426							0.042
Yes	12,556	47.1	48.2	9,396	74.8	73.1	3,160	25.2	26.9		385	3.1	2.9	12,171	96.9	97.1	
No	14,119	52.9	51.8	10,443	74.0	72.6	3,676	53.8	27.4		442	3.1	2.9	13,677	96.9	97.1	
Area										0.239							0.652
Seoul	5,306	19.9	20.5	3,896	73.4	72.0	1,410	26.6	28.0		147	2.8	2.7	5,159	97.2	97.3	
Metropolitan city	6,901	25.9	26.6	5,196	75.3	73.6	1,705	24.7	26.4		209	3.0	2.7	6,692	97.0	97.3	
Elsewhere	14,468	54.2	52.9	10,747	74.3	72.8	3,721	25.7	27.2		471	3.3	3.0	13,997	96.7	97.0	
Gender										<.0001							<.0001
Men	11,422	42.8		8,743	76.6	74.3	2,679	23.5	25.7		303	2.7	2.3	11,119	97.4	97.7	
Women	15,253	57.2		11,096	72.8	71.4	4,157	27.3	28.6		524	3.4	3.4	14,729	96.6	96.6	
Age										<.0001							<.0001
29 years old or younger	3,274	12.3	18.7	2,172	66.3	67.4	1,102	33.7	32.6		95	2.9	2.7	3,179	97.1	97.3	
30-39	4,370	16.4	18.8	2,889	66.1	65.2	1,481	33.9	34.8		83	1.9	1.9	4,287	98.1	98.1	
40-49	4,890	18.3	20.6	3,563	72.9	72.8	1,327	27.1	27.2		102	2.1	2.2	4,788	97.9	97.8	
50-59	5,169	19.4	19.7	3,952	76.5	76.4	1,217	23.5	23.6		170	3.3	3.2	4,999	96.7	96.8	
60-69	4,624	17.3	12.0	3,738	80.8	81.0	886	19.2	19.0		178	3.9	3.7	4,446	96.2	96.3	
70 years old or older	4,348	16.3	10.1	3,525	81.1	80.9	823	18.9	19.1		199	4.6	4.9	4,149	95.4	95.1	
Income										0.554							<.0001
Low	5,085	19.1	15.2	3,754	73.8	71.9	1,331	26.2	28.1		330	6.5	6.7	4,755	93.5	93.3	
Low to middle	6,646	24.9	24.1	4,941	74.4	72.9	1,705	25.7	27.1		227	3.4	3.1	6,419	96.6	96.9	
Middle to high	7,316	27.4	29.6	5,437	74.3	72.8	1,879	25.7	27.2		141	1.9	1.9	7,175	98.1	98.1	
High	7,628	28.6	31.1	5,707	74.8	73.3	1,921	25.2	26.7		129	1.7	1.8	7,499	98.3	98.2	
Education										<.0001							<.0001
Elementary school graduate or higher	5,970	22.4	15.7	4,545	76.1	75.5	1,425	23.9	24.5		324	5.4	5.9	5,646	94.6	94.1	
Junior high school graduate	2,788	10.5	9.0	2,225	79.8	78.6	563	20.2	21.4		108	3.9	4.1	2,680	96.1	95.9	
High school graduate	8,773	32.9	36.8	6,502	74.1	73.3	2,271	25.9	26.7		266	3.0	3.0	8,507	97.0	97.0	
University graduate or higher	9,144	34.3	38.5	6,567	71.8	70.0	2,577	28.2	30.0		129	1.4	1.3	9,015	98.6	98.7	
Marital status										<.0001							0.928
Married	22,404	84.0	76.9	17,006	75.9	74.5	5,398	24.1	25.5		693	3.1	2.9	21,711	96.9	97.1	
Single	4,271	16.0	23.1	2,833	66.3	67.3	1,438	33.7	32.7		134	3.1	2.9	4,137	96.9	97.1	
Subjective health condition										<.0001							<.0001
Good	7,777	29.2	31.1	6,499	83.6	82.2	1,278	16.4	17.8		130	1.7	1.5	7,647	98.3	98.5	
Average	13,705	51.4	51.5	10,260	74.9	72.8	3,445	25.1	27.2		303	2.2	2.2	13,402	97.8	97.8	
Bad	5,193	19.5	17.4	3,080	59.3	56.3	2,113	40.7	43.7		394	7.6	7.4	4,799	92.4	92.6	
Whether drinking										<.0001							0.007
No	3,262	12.2	9.6	2,537	77.8	77.2	725	22.2	22.8		128	3.9	3.9	3,134	96.1	96.1	
Yes	23,413	87.8	90.4	17,302	73.9	72.4	6,111	26.1	27.6		699	3.0	2.8	22,714	97.0	97.2	
Whether smoking										<.0001							<.0001
Current smoker	4,924	18.5	22.3	3,320	67.4	66.3	1,604	32.6	33.7		202	4.1	3.9	4,722	95.9	96.1	
Former smoker	5,486	20.6	20.5	4,274	77.9	75.9	1,212	22.1	24.1		164	3.0	2.6	5,322	97.0	97.4	
Non-smoker	16,265	61.0	57.2	12,245	75.3	74.3	4,020	24.7	25.7		461	2.8	2.6	15,804	97.2	97.4	
Number of days of walk per week										<.0001							<.0001
Never	4,846	18.2	16.5	3,459	71.4	70.3	1,387	28.6	29.7		219	4.5	4.4	4,627	95.5	95.6	
1-2	4,561	17.1	17.3	3,292	72.2	71.1	1,269	27.8	28.9		159	3.5	3.2	4,402	96.5	96.8	
3-4	5,399	20.2	20.1	4,096	75.9	74.4	1,303	24.1	25.6		153	2.8	2.6	5,246	97.2	97.4	
5-6	4,417	16.6	17.3	3,332	75.4	73.3	1,085	24.6	26.7		91	2.1	2.0	4,326	97.9	98.0	
Everyday	7,452	27.9	28.9	5,660	76.0	74.1	1,792	24.1	25.9		205	2.8	2.5	7,247	97.3	97.5	
	26,675	100.0	100.0	19,839	74.4	72.9	6,836	25.6	27.1		827	3.1	2.9	25,848	96.9	97.1	

Among the participants, 9,584 (39.5%) did not feel uncomfortable with the chewing problem at all, of whom 7,421 (75.9%) responded that they felt less stress, and 2,163 (24.1%) responded that they felt a lot of stress. Furthermore, out of 9,584 people, 185 (1.9%) consented to whether they have suicidal ideation, and 9,399 (98.1%) did not consent to whether to have suicidal ideation.

Compared to the group who felt very uncomfortable with the chewing problem, the percentage of those feeling less stressed and the percentage of not agreeing on whether to have suicidal thoughts increased as the group that was not at all uncomfortable with the chewing problem increased, whereas the group that was not at all uncomfortable with the chewing problem was very uncomfortable, and it is evident that the percentage of respondents who responded that they were under a lot of stress was higher in the group that felt the suicidal ideation, and the percentage of consenting to whether suicidal thoughts were also gradually increasing. The result of the 'speaking problem' is the same as the result of the 'chewing problem'.

Of the 13,033 (47.6%) participants who used 0 items for oral health, 9,780 (73.4%) responded that they felt less stress, and 3,253 (26.6%) responded that they felt very stressed out of 13,033 people. 460 people (3.2%) out of 13,033 people agreed with whether they thought of suicide or not, and the remaining 12,573 people (96.8%) did not agree. The number of participants who used three or more items for oral health was the lowest with a total of 988 (3.9%). Of them, 697 people (68.4%) responded that they felt less stress, and 291 people (31.6%) said they felt a lot of stress. Furthermore, 22 out of 988 (1.8%) consented to suicidal ideation, and 966 (97.8%) did not agree to suicidal ideation.

Table 2 illustrates the results of correcting the control variables to determine the extent of stress perception according to the oral problem. Model 1 is an analytic model without making correction for the speaking problem variable, while Model 2 is an analytic model without making correction for the chewing problem variable. Model 3, which includes the chewing problem variable and the speaking problem variable as control variables, is a table illustrating the level of stress experienced when both the chewing problem and speaking problem are experienced. Stress perception was 2.394 times higher (OR: 2.394, 95% CI: 2.001-2.864, P-value <0.0001) in the group who responded that they felt very uncomfortable in the chewing problem, but in the group who felt very uncomfortable in the speaking problem, it was not statistically significant that the extent of stress perception was 1.208 times higher (OR: 1.208, 95% CI: 0.918-1.590, P-value = 0.177).

Table 2. Analysis of relevance of the chewing problem and speaking problem and the extent of the perception of stress

	Extent of the perception of stress											
	OR	95%CI		P-value	OR	95%CI		P-value	OR	95%CI		P-value
Chewing problem												
Very uncomfortable	2.649	2.271	3.091	<.0001					2.394	2.001	2.864	<.0001
Uncomfortable	1.546	1.393	1.715	<.0001					1.466	1.307	1.644	<.0001
Moderate	1.337	1.208	1.479	<.0001					1.311	1.174	1.463	<.0001
Not uncomfortable	1.112	1.013	1.220	0.026					1.091	0.989	1.205	0.083
Not uncomfortable at all	1.000								1.000			
Speaking problem												
Very uncomfortable					2.196	1.718	2.806	<.0001	1.208	0.918	1.590	0.177
Uncomfortable					1.629	1.434	1.850	<.0001	1.223	1.061	1.410	0.006
Moderate					1.214	1.085	1.358	0.001	1.017	0.902	1.148	0.779
Not uncomfortable					1.152	1.053	1.260	0.002	1.055	0.957	1.162	0.281
Not uncomfortable at all					1.000				1.000			

	Extent of the perception of stress											
	OR	95%CI		P-value	OR	95%CI		P-value	OR	95%CI		P-value
Items used for oral health (count)												
0	0.832	0.697	0.994	0.042	0.841	0.704	1.005	0.056	0.834	0.698	0.995	0.044
1-2	0.815	0.686	0.968	0.020	0.816	0.686	0.970	0.021	0.814	0.685	0.967	0.019
3 or more	1.000				1.000				1.000			
Whether used dental hospital or clinic												
Yes	0.938	0.875	1.005	0.070	0.927	0.866	0.994	0.032	0.940	0.877	1.008	0.081
No	1.000				1.000				1.000			
Area												
Seoul	1.063	0.969	1.166	0.194	1.054	0.961	1.155	0.263	1.064	0.970	1.167	0.187
Metropolitan city	0.959	0.881	1.044	0.333	0.956	0.878	1.040	0.295	0.959	0.881	1.044	0.335
Elsewhere	1.000				1.000				1.000			
Gender												
Men	0.706	0.644	0.774	<.0001	0.697	0.636	0.764	<.0001	0.705	0.643	0.772	<.0001
Women	1.000				1.000				1.000			
Age												
29 years old or younger	4.220	3.449	5.164	<.0001	3.873	3.175	4.725	<.0001	4.287	3.504	5.245	<.0001
30-39	4.000	3.389	4.721	<.0001	3.779	3.202	4.459	<.0001	4.079	3.454	4.817	<.0001
40-49	2.727	2.328	3.194	<.0001	2.590	2.214	3.029	<.0001	2.775	2.368	3.251	<.0001
50-59	2.040	1.761	2.363	<.0001	1.984	1.714	2.296	<.0001	2.066	1.782	2.395	<.0001
60-69	1.299	1.137	1.485	0.000	1.276	1.117	1.458	0.000	1.310	1.146	1.498	<.0001
70 years old or older	1.000				1.000				1.000			
Income												
Low	1.144	1.008	1.298	0.037	1.159	1.022	1.315	0.022	1.138	1.003	1.291	0.045
Low to middle	1.022	0.925	1.129	0.672	1.032	0.934	1.140	0.534	1.020	0.924	1.127	0.695
Middle to high	0.975	0.893	1.065	0.571	0.980	0.898	1.070	0.656	0.974	0.892	1.064	0.564
High	1.000				1.000				1.000			
Education												
Elementary school graduate or higher	0.892	0.775	1.027	0.113	0.924	0.803	1.063	0.267	0.886	0.769	1.021	0.094
Junior high school graduate	0.674	0.582	0.781	<.0001	0.686	0.592	0.794	<.0001	0.670	0.577	0.776	<.0001
High school graduate	0.815	0.753	0.882	<.0001	0.823	0.760	0.890	<.0001	0.815	0.753	0.882	<.0001
University graduate or higher	1.000				1.000				1.000			
Marital status												
Married	0.981	0.868	1.108	0.754	0.983	0.870	1.110	0.777	0.981	0.868	1.109	0.763
Single	1.000				1.000				1.000			
Subjective health condition												
Good	0.253	0.227	0.282	<.0001	0.242	0.217	0.270	<.0001	0.254	0.228	0.283	<.0001
Average	0.446	0.409	0.486	<.0001	0.433	0.397	0.472	<.0001	0.448	0.411	0.489	<.0001
Bad	1.000				1.000				1.000			
Whether drinking												
No	0.954	0.852	1.068	0.417	0.960	0.858	1.074	0.478	0.953	0.851	1.067	0.406
Yes	1.000				1.000				1.000			
Whether smoking												
Current smoker	1.557	1.400	1.733	<.0001	1.606	1.444	1.786	<.0001	1.553	1.396	1.728	<.0001
Former smoker	1.240	1.111	1.384	0.000	1.257	1.126	1.403	<.0001	1.238	1.109	1.382	0.000
Non-smoker	1.000				1.000				1.000			
Number of days of walk per week												
Never	1.145	1.037	1.264	0.007	1.149	1.041	1.269	0.006	1.142	1.034	1.261	0.009
1-2	1.049	0.947	1.162	0.358	1.058	0.956	1.171	0.277	1.050	0.948	1.163	0.350
3-4	0.939	0.850	1.036	0.209	0.939	0.851	1.036	0.211	0.939	0.851	1.037	0.215
5-6	0.978	0.880	1.086	0.675	0.981	0.884	1.088	0.711	0.979	0.881	1.087	0.691
Everyday	1.000				1.000				1.000			

Table 3 illustrates the results of correcting the control variables to determine whether suicidal ideation is caused by the oral problem. Model 1 is an analytic model without making correction for the speaking problem variable, and Model 2 is an analytic model without making correction for the chewing problem variable. Model 3, which included chewing problem variable and speaking problem variable as control variables, indicates whether suicidal ideation occurs when both the chewing problem and speaking problem are experienced. The group feeling very uncomfortable in the chewing problem had 1.811 times more suicidal thoughts (OR: 1.811, 95% CI: 1.277-2.569, P-value = 0.001), and the group feeling very uncomfortable in the speaking problem had suicidal thoughts 1.762 times more. (OR: 1.762, 95% CI: 1.112-2.792, P-value = 0.016).

Table 3. Analysis of relevance of the chewing problem and speaking problem and the thought of suicide

	Thought of suicide											
	OR	95%CI		P-value	OR	95%CI		P-value	OR	95%CI		P-value
Chewing problem												
Very uncomfortable	2.326	1.688	3.205	<.0001					1.811	1.277	2.569	0.001
Uncomfortable	1.478	1.135	1.925	0.004					1.310	0.976	1.759	0.072
Moderate	1.234	0.929	1.640	0.147					1.045	0.771	1.416	0.778
Not uncomfortable	1.050	0.811	1.359	0.713					0.959	0.729	1.261	0.764
Not uncomfortable at all	1.000								1.000			
Speaking problem												
Very uncomfortable					2.658	1.733	4.076	<.0001	1.762	1.112	2.792	0.016
Uncomfortable					1.422	1.082	1.869	0.012	1.153	0.850	1.563	0.361
Moderate					1.564	1.193	2.049	0.001	1.457	1.094	1.940	0.010
Not uncomfortable					1.243	0.987	1.566	0.064	1.218	0.951	1.561	0.119
Not uncomfortable at all					1.000				1.000			
Items used for oral health (count)												
0	1.008	0.617	1.648	0.974	1.034	0.632	1.692	0.895	0.834	0.698	0.995	0.044
1-2	1.201	0.734	1.964	0.466	1.207	0.737	1.977	0.454	0.814	0.685	0.967	0.019
3 or more	1.000				1.000				1.000			
Whether used dental hospital or clinic												
Yes	0.986	0.822	1.182	0.876	0.968	0.807	1.160	0.723	0.983	0.820	1.180	0.856
No	1.000				1.000				1.000			
Area												
Seoul	1.072	0.807	1.423	0.632	1.067	0.806	1.412	0.652	1.078	0.813	1.427	0.603
Metropolitan city	0.941	0.725	1.221	0.646	0.930	0.717	1.207	0.586	0.938	0.723	1.218	0.631
Elsewhere	1.000				1.000				1.000			
Gender												
Men	0.521	0.403	0.673	<.0001	0.508	0.393	0.656	<.0001	0.513	0.397	0.664	<.0001
Women	1.000				1.000				1.000			
Age												
29 years old or younger	1.591	0.935	2.707	0.087	1.504	0.885	2.558	0.132	1.638	0.960	2.792	0.070
30-39	1.410	0.907	2.192	0.127	1.390	0.891	2.170	0.147	1.472	0.943	2.297	0.089
40-49	1.396	0.928	2.100	0.109	1.354	0.900	2.037	0.145	1.427	0.948	2.148	0.088
50-59	1.468	1.071	2.013	0.017	1.434	1.049	1.961	0.024	1.480	1.080	2.028	0.015
60-69	1.146	0.894	1.470	0.280	1.132	0.885	1.449	0.322	1.152	0.899	1.476	0.264
70 years old or older	1.000				1.000				1.000			
Income												
Low	1.990	1.480	2.675	<.0001	1.997	1.482	2.690	<.0001	1.966	1.460	2.645	<.0001
Low to middle	1.271	0.975	1.659	0.077	1.276	0.978	1.665	0.073	1.265	0.969	1.651	0.084
Middle to high	0.884	0.667	1.173	0.392	0.887	0.668	1.177	0.405	0.885	0.666	1.175	0.398
High	1.000				1.000				1.000			

	Thought of suicide											
	OR	95%CI		P-value	OR	95%CI		P-value	OR	95%CI		P-value
Education												
Elementary school graduate or higher	2.701	1.828	3.989	<.0001	2.744	1.870	4.027	<.0001	2.633	1.786	3.882	<.0001
Junior high school graduate	2.249	1.544	3.278	<.0001	2.248	1.554	3.250	<.0001	2.191	1.510	3.179	<.0001
High school graduate	1.985	1.547	2.548	<.0001	1.989	1.550	2.553	<.0001	1.969	1.534	2.528	<.0001
University graduate or higher	1.000				1.000				1.000			
Marital status												
Married	0.688	0.498	0.951	0.024	0.688	0.498	0.951	0.023	0.693	0.501	0.957	0.026
Single	1.000				1.000				1.000			
Subjective health condition												
Good	0.329	0.249	0.436	<.0001	0.323	0.245	0.427	<.0001	0.336	0.253	0.445	<.0001
Average	0.416	0.341	0.507	<.0001	0.404	0.333	0.492	<.0001	0.419	0.344	0.511	<.0001
Bad	1.000				1.000				1.000			
Whether drinking												
No	0.966	0.727	1.285	0.813	0.973	0.732	1.294	0.852	0.962	0.723	1.280	0.791
Yes	1.000				1.000				1.000			
Whether smoking												
Current smoker	2.118	1.628	2.757	<.0001	2.178	1.676	2.829	<.0001	2.115	1.624	2.755	<.0001
Former smoker	1.572	1.191	2.075	0.001	1.596	1.210	2.105	0.001	1.576	1.193	2.082	0.001
Non-smoker	1.000				1.000				1.000			
Number of days of walk per week												
Never	1.323	1.020	1.716	0.035	1.323	1.021	1.715	0.034	1.324	1.021	1.715	0.034
1-2	1.280	0.991	1.653	0.059	1.290	1.000	1.664	0.050	1.283	0.993	1.658	0.057
3-4	1.056	0.816	1.366	0.679	1.054	0.815	1.362	0.689	1.057	0.817	1.367	0.673
5-6	0.869	0.650	1.164	0.346	0.867	0.648	1.160	0.336	0.874	0.652	1.170	0.365
Everyday	1.000				1.000				1.000			

4. Discussion

This study analyzed the effect of oral problem on the mental health by examining the extent of stress perception and suicidal ideation according to the oral problem of the public using the 7th National Health and Nutrition Survey data.

As a result of the study conducted, the group that felt very uncomfortable in the chewing problem and the speaking problem had a higher level of stress perception and higher suicidal thoughts than the group that said it was not at all uncomfortable, which is consistent with the results of a previous study (Park, 2014, pp. 182-183) which claimed that the oral health affects the quality of life and mental health, including stress and suicidal thoughts.

When an oral problem occurs, it interferes with the essential daily life skills such as expression and food intake, resulting in the negative judgments and lowering the quality of life. The group experiencing discomfort due to the problem had a low quality of life, and the occurrence of oral problems was said to affect the quality of life. (Park, 2014, pp. 182-183) Oral problems are the factors that negatively affect daily life, such as oral function, ability, and confidence, and lower the quality of life in the public (Choi et al., 2010, pp. 412-419), and there is a close relationship between the oral problems and stress and suicidal thoughts. (Kang, 2019, p. 7) The mental health

problems can ultimately cause mental illness, and mental illness is a disease with a very high prevalence and at the same time the socioeconomic cost of mental illness is high (Ministry of Health and Welfare, 2011), and hence, it can negatively affect the people's quality of life. It is evident that the quality of life is an intrinsic evaluation of culture, society, and environment, including physical health, mental state, independence, and social relationships (Son et al., 2010, pp. 141-151), which indicates that the quality of life and mental health are closely related. Hence, oral problems lower the quality of life, and the quality of life is closely related to the mental health, and hence, it can be said that the results of this study that oral problems affect the mental health are natural.

Meanwhile, the dental treatment costs, which are a major problem in improving the individuals' oral health, are relatively low in coverage in the non-insured fields (Kim et al., 2012, p. 208), and hence, require very high treatment costs, and according to the statistics of the Open Health and Medical Big Data System, the cost of medical care benefits related to dental treatment was counted among the high ranks (Open Health and Medical Big Data System – The 2019 Statistics on Frequent Injury and Disease, 2019). As of 2017, the average dental cost per person was 520,000 won, an increase of 49% from 2011 to 2016, and the total cost of dental treatment is continuously increasing. (Dental Medical Policy Research Institute, 2020) Hence, among the group that cannot afford dental treatment costs, the use of dental services may be restricted and health inequality may occur. Furthermore, inequality exists in oral health according to specific groups such as income level and disability. The lower the income level, the higher the rate of complaints about mastication discomfort and the higher the prevalence of oral disease (Ministry of Health and Welfare, 2019).

In the case of the physically and mentally challenged, the access to dental services is limited due to the lack of infrastructure and burden of medical expenses, and hence, the proper treatment is not provided (Yun et al., 2005, p. 26), yielding the poor oral health for the disabled. Following which, in the case of the elderly, over half of the population complained of discomfort in their chewing problems due to the oral problems, and the quality of life related to the oral health was very poor. (Ministry of Health and Welfare, 2006) Based on which, it is evident that tge health inequality exists according to the sociodemographic characteristics in terms of the oral health.

The oral problems ultimately cause health inequality and incur very high treatment costs, but also demonstrate a relationship between the oral function and various factors such as overall health, sociality, self-confidence, and life satisfaction, and it was found that the more the oral problem was recognized, the lower the quality of life related to oral health. (Choi et al., 2010, pp. 412-419) The oral health is a very important part of the quality of life, and the loss of oral health adversely affects the mental health (Lee, 2020, p. 292), and hence, it is evident that oral health is a major variable, and in order to prevent mental illness caused by oral problems and to resolve health inequality, policy support is required to ensure that all people can receive dental services equally. Furthermore, the prevention of oral problems can prevent the occurrence of all problems derived from oral problems, and hence, various efforts such as development of programs to improve oral health and publicity through the media are required.

However, in this study conducted to investigate the relationship between the chewing and speaking problems and the mental health, only two of the various oral problems were investigated, and hence, there is a limitation in that it is difficult to generalize the research results compared to other studies

on mental health. Furthermore, while the study on the relationship between the oral problem and mental health according to demographic characteristics such as middle-aged, elderly, and disabled people is currently in progress, there are insufficient studies on the relationship between the oral problem and the mental health without being limited to a specific group. Hence, this study is not limited to a specific group and analyzed how each oral problem affects the mental health, and hence, it is expected to be used as the basic policy and institutional data to help prevent the deterioration of the mental health through the improvement of the oral health problems.

5. Conclusion

This study examined the effects of such oral problems as the chewing and speaking problems on the mental health using the 7th National Health and Nutrition Survey conducted among the adults aged 19 or older. As a result of the study conducted, it turned out that the more discomfort they felt with the chewing and speaking problems, the more they affected their mental health. Hence, in order to prevent the further deterioration of mental health, and if the oral health improvement policy is provided for the groups who are perceived as having the chewing problem and speaking problem to prevent the further deterioration of their oral health, it would be to help alleviate their mental health, especially the suicidal ideation and perceived stress.

Conflicts of interest

No author has any financial or other conflict of interest to declare.

References

Choi, J. S., Lee, Y. J., Jeon, S. B., Kim, H. M., Jeong, E. H., & Jo, E. J. (2010). The association between self-reported oral health problems and oral health-related quality of life. *Journal of Korean Academy of Oral Health, 3*4(3), 411-421.

Dental Policy Research Institute. (2016). Regional Status and Gap of Dental Care in Korea.

Dental Policy Research Institute. (2020). Trends in Outpatient Dental Expenses in Korea.

Kang, H. K. (2019). A Study on the relationship between physical activity, mental health, oral health and quality of life according to chewing difficulty. *Journal of Korean Society of Oral Health Science, 7*(2), PP. 1-8.

Kim, H. S., Kim, M. G., & Shin, H. S. (2012). Expenditure in ambulatory dental care and factors related to its spending. *Health Policy and Management, 22*(2), 207-224.

Kim, H. Y., Lee, S. H., Kim, G. S., & Shin, K. D. (2012). Stress Society Korea: Causes and Alternatives. *Gyeonggi Research Institute*, 1.

Kim, S. H. (2018). Effects of Nutrient Intake on Oral Health and Chewing Difficulty by Age Group.

Journal of Korea Academia-Industrial cooperation Society, 19(2), PP.202-209.

Lee, J. N. (1999). Modern health and stress. *Policy and regional development*, 726.

Lee, K. H. (2020). Relationship between oral health and suicide attempts in Korean adults :The 7th Korea National Health and Nutrition Examination Survey (7th KNHANES, 2016-2018). *Journal of Korean society of Dental Hygiene, 20*(3), 291-302.

Lm, I. J. (2020). Chewing and Speaking Difficulties, Quality of Life and Depression in Elderly Koreans: A Survey of the Korea National Health And Nutrition Examination From 2016~2018. *Journal of Speech-Language & Hearing Disorders, 29*(4), 121-130.

Ministry of Health and Welfare. (2006). National Oral Health Survey.

Ministry of Health and Welfare. (2011). Mental Illness Epidemiologic Survey Report.

Ministry of Health and Welfare. (2019). Oral Policy and Oral Policy Implementation Plan.

Nam, M. H. et al. (2011). Depression, suicide, and Korean society. *Journal of the Korean Medical Association, 54*(5), 358-631.

Nam, Y. O., Park, C. E., Park, J. H., & Kim, Y. I. (2006). A study on the oral health awareness of the elderly for dental health project planning. *J Korean Acad Dental Hygiene Education. 6*(4), 325-337.

Park, H. M. (2014). Effects of Oral Health Behavior and Status of Elderly People in Korea on Mental Health and Quality of Life. *The Korean Journal of Health Service Management, 8*(4), 175-185.

Son, A. R., Yun, J. T., Ko, S. D., & Chun, S. S. (2010). Health-related Quality of Life Assessment by Socio-Demographic Characteristics and Mental Health among Seoul Citizens. *KOREAN JOURNAL OF HEALTH EDUCATION AND PROMOTION, 27*(4), 141-152.

Son, E. G. (2021). The effects of oral function problems and dental treatment on quality of life: Comparison of data from the National Health and Nutrition Examination Survey 2013, 2016, and 2019. *Journal of Korea Academia-Industrial cooperation Society, 22*(11), 203-210.

Yun, H. S. et al. (2005). A SURVEY ON THE ORAL HEALTH STATUS OF THE DISABLED IN BUSAN, KOREA. *Korean Association for Disability and Oral Health,* 1(1), 25-32.