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Original Article

The Effects of Health and Unmet Dental Care Needs on the Health-Related Quality of Life in Korea Older Adults: A Nationwide Study

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Abstract

Background: The purpose of this cross-sectional study was to assess the relationship between oral health, unmet dental needs and health-related quality of life in South Korea older adults.

Methods: The present study used raw data from the 2019~2020 Korea National Health and Nutrition Examination Survey, and analyzed 4956 participants aged over 65 yr. Hierarchical multiple regression analysis was used for associations between oral health, unmet dental needs, and HRQoL.

Results: The EQ-5D index differed according to tooth pain, chewing difficulty, speaking problem, subjective oral health status, oral examination, and unmet dental care needs (P<0.001). In the model 2, male, under 75 yr of age, high school graduate or higher, employed, living with a spouse, no stress, good subjective health status, no speaking problem, and no unmet dental care needs were associated with higher EQ-5D index (Adj R^2 = 27.6%, P<0.001).

Conclusion: To improve the HRQoL of older adults in South Korea, oral health problems need to be minimized through oral disease prevention and oral health education programs.

Keywords: Oral health; Unmet dental care needs; Health-related quality of life

Introduction

Oral health is not only a core indicator of general health, well-being, and quality of life, but it is an important health problem within general health (1). Oral health is significantly related to nutritional intake and digestion (2,3). Moreover, oral health is associate with appearance and communication. Consequently, by influencing self-confidence and satisfaction in interpersonal relationships and social life, oral health also, is associated with the quality of life (4). Oral health can incur pain, discomfort and loss of productivity, and can reduce the quality of life and increase financial burden (5,6). Oral health is a part of general health and a very important factor in

maintaining the quality of life and social well-being. With age, the effects of oral health on general health and quality of life increase (7,8). Changes in oral health are often considered a part of aging and oral diseases tend to be neglected by older adults because oral conditions generally do not interfere with life, unlike other systemic diseases (9). Poor oral health not only causes physical problems, but also interpersonal, social, and psychological problems. Thus, oral health is associate with the quality of life through various aspects (10,11). Since oral health is an important factor in the quality of life, situations in which oral diseases are untreated will likely have a negative relation on the quality of life.

Health-related quality of life (HRQoL), defined as subjective satisfaction with life in physical, psychological, and socioeconomic domains, is becoming increasingly important in older adults with the increase in life expectancy (8,12). HRQoL has several influencing factors, but in low socioeconomic vulnerable groups, HRQoL may be further lowered due to health inequality (13).

'Unmet dental care' refers to cases in which dental care is not met despite the need for dental care (14). Unmet medical needs are associated with HRQoL which is a growing concern in public health (3,12-15). When timely treatment of oral diseases is not available or not possible, the risk of oral health deterioration, such as tooth loss, increases, and in turn, leads to enormous economic costs (16). Additionally, when dental needs are unmet, untreated dental problems cause chewing discomfort, periodontal disease, pain, and bad breath, leading to interpersonal relationship difficulties, depression, social isolation, and adversely associate with the quality of life (17-19).

In previous studies, oral health has been studied as a part of general health, not include social-economic condition such as living with spouse or not, education level, economic status, stress so on (20).

Launched in 1998, the Korea National Health and Nutrition Examination Survey (KNHANES) is a nationally representative, cross-sectional survey targeting non-institutionalized Korean's adults, and is conducted annually to assess the health behavior of the population (21). The KNHANES comprises health interviews, nutrition surveys, and physical examinations, and samples that can represent Koreans were extracted through stratified, multi-staged, clustered, and probability design to increase representativeness and estimation accuracy (21,22). In addition, KNHANES VIII introduced the rolling survey sampling method so that each rotational sample for each survey year becomes a probability sample representing the whole country, and each rotational sample has independent and homogeneous characteristics (21,22).

The present study used data from the 2019-2020 KNHANES to ensure a representative sample of elderly Koreans. The purpose of the present study was to determine the relationship between oral health, unmet dental care and HRQoL. The specific objectives of the present study were as follows: 1) to assess the difference in HRQoL according to the participants` general characteristics, oral health, and unmet dental care; and 2) to assess oral health factors and unmet dental care relation to HRQoL.

Materials and Methods

Study Data and Study Participants

The present study is a cross-sectional study that analyzed raw data from the 2019-2020 of Korea National Health and Nutrition Examination Survey (KNHANES) VIII under the official approval of the relevant institution. The KNHANES VIII was approved with an IRB(No. 2018-01-03-C-A, 2018-01-03-2C-A) from the Korea Disease Control and Prevention Agency (KDCA). The KNHANES questionnaire was used after discussing the validity of the survey items and survey contents through an advisory committee composed of experts in each department based on health indicators provided by international organizations such as WHO and Organization for Economic Co-operation and Development (OECD). The KNHANES health survey uses a structured questionnaire, and the health interview

is carried out together with the examination survey by the Computer-Assisted Personal Interviewing (CAPI) and the contents of the health behavior by the Computer-Assisted self-reported Interviewing method (CASI). This information can be found on the KNHANES website (22). KDCA constructed a database linking KNHANES and opened the raw data. We received the raw data bias KDCA link to conduct this study. We obtained permission to use the data before downloading and using it on December 1, 2022. The present study included data from 4956 older adults, aged over 65 yr (2,135 men and 2,821 women) obtained from raw data surveyed in 2019 to 2020 (n=24,269). Those with missing data from the questionnaire and/or those with missing test values were excluded from the final analysis.

Covariates

The demographic characteristics of the participants were comprised as follows.

The participants were divided into two groups according to age (the 65-74-year-old group and the 75 yr and older group). Education level was classified as elementary or lower, middle, high school, and college or higher. Economic status was classified into quartiles of adjusted household income per family member using the following formula: equivalent income (monthly average household income/√[number of family members])(23). Private health insurance was classified as 'yes' when the participant subscribed to health insurance that subsidized medical expenses.

Current smoking was classified as "yes," and nonsmoking was classified as "no." In terms of alcohol use, based on drinking experience over the past year, drinking more than once a month was classified as "yes," and if not, was classified as "no." Stress was categorized as "high" if the participants responded "a great deal" or "quite a lot" to the question: "How much stress do you feel in your daily life?" Stress was categorized as "low" if the answer was "a little" or "almost none." Subjective health status was classified as 'good' and if not 'bad'.

Oral health status

In the raw data, dental caries was classified as 'yes (≥1)' or 'no (0)' in the item, 'presence of permanent dental caries'. The raw data for periodontal disease classified the item: 'presence of periodontal disease', as 'yes' or 'no'. For tooth pain, the raw data classified the item, 'Have you had tooth pain in the past year?" as "yes" or "no". Chewing difficulties were assessed by the item, 'Do you feel uncomfortable chewing food due to problems in your mouth including teeth, dentures, or gums?" and it was classified as 'uncomfortable' and 'comfortable'. Speaking problem was identified in response to the question, "Do you feel difficulty or discomfort in speaking clearly due to problems in your mouth including teeth, dentures, or gums?" and it was classified as 'uncomfortable' and 'comfortable'.

Subjective oral health status was identified in response to, "How do you feel about your oral health in daily life, including your teeth and gums?" and it was classified as 'good' and 'bad'.

Dental examination was confirmed by the item, "In the last year, there were no special problems in your mouth, but have you ever had an oral examination to check your oral health?", and the response was either 'yes' or 'no'.

Unmet dental needs

'Unmet dental needs' was identified in the 'unsatisfied dental care' and 'reasons for unmet dental care' items of the oral health questionnaire in the health behavior survey. A 'yes' response to the question, "In last year, have you ever thought you needed dental care (examination or treatment) but did not receive treatment?" was considered as 'unmet dental needs'.

Health-related quality of life (HRQoL)

The EQ-5D (EuroQol-5 Dimension) and EQ-5D index developed by the EuroQol group was used as the HRQoL measure (24,25). The measure assesses five HRQoL dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. In the present study, "some problems" and "severe problems" were grouped together as "yes" with regard to problems. The

EQ-5D index, which is the score for HRQoL, is calculated by applying a weight to each of the five dimensions (26). The range of values is between 1 point, representing perfect health status, to -1 point, representing health status worse than death. The calculation method is as follows.

EQ5D = 1 – (0.05 + 0.096*M2 + 0.418*M3 + 0.046*SC2 + 0.136*SC3 + 0.051*UA2 + 0.208*UA3 + 0.037*PD2 + 0.151*PD3 + 0.043*AD2 + 0.158*AD3 + 0.05*N3)

Statistical analysis

All data were presented as mean±SD for continuous variables or as n (%) for categorical variables. The SAS survey procedure (ver. 9.3; SAS Institute Inc., Cary NC, USA) was used for data analysis of the survey data. Continuous variables were presented as mean ± SE values. Differences in EQ-5D index according to demographic, oral health-related characteristics, and unmet dental needs were assessed using t-tests and χ^2 tests. After correcting the participant demographic and health-related characteristics that were significant in the difference test by covariates, hierarchical multiple regression analysis was conducted to confirm the association between oral health-related characteristics, unmet dental needs, and HRQoL.

Results

Demographic and health-related characteristics in relation to HRQoL

Older adults with elementary school-level or lower education, and low economic status demonstrated the lowest HRQoL (Table 1).

Table 1: Demographic and health-related characteristics in relation to the HRQoL among a sample of Korean older adults (n=24,269)

Classification			*N(%)*	*EQ-5D index*	
				M±SD	t~X2(*p*)
Demographic characteristics	Sex	Male	2135(43.1)	0.91(0.14)	13.07(<0.001)
		Female	2821(56.9)	0.85(0.17)	
	Age(yr)	65~74	2905(58.6)	0.90(0.14)	11.48(<0.001)
		≥ 75	2051(41.4)	0.84(0.18)	
	Education level	≤Elementary school	2652(58.8)	0.85(0.18)	29.02(<0.001)
		Middle school	661(14.7)	0.89(0.15)	
		High school	750(16.7)	0.92(0.11)	
		≥College	442(9.8)	0.93(0.12)	
	[1]Economic status	Lower	2377(48.3)	0.85(0.18)	26.71(<0.001)
		Lower middle	1340(27.3)	0.90(0.14)	
		Middle high	714(14.5)	0.91(0.14)	
		High	489(9.9)	0.92(0.13)	
	Living with a spouse	Yes	1669(33.7)	0.90(0.14)	-8.04(<0.001)
		No	3287(66.3)	0.84(0.18)	
	Occupation status	Yes	1490(33.1)	0.91(0.13)	6.86(<0.001)
		No	3018(66.95)	0.86(0.17)	
	Private health insurance	Yes	2000(40.7)	0.91(0.13)	8.02(<0.001)
		No	2914(59.3)	0.86(0.18)	
health-related characteristics	Smoking (current)	Yes	4369(88.2)	0.88(0.17)	-1.78(0.07)
		No	587(11.8)	0.89(0.13)	
	Drinking (current)	Yes	2037(41.1)	0.87(0.17)	-1.59(0.11)
		No	2919(58.9)	0.88(0.16)	
		No	3129(30.4)	0.86(0.17)	
	Subjective health status	Good	3225(68.2)	0.94(0.10)	260.23(<0.001)
		Bad	1504(31.8)	0.78(0.19)	
	Stress	Yes	922(19.7)	0.79(0.21)	10.12(<0.001)
		No	3771(80.3)	0.90(0.14)	

[1]Economic status: monthly average gross household income/ √ (number of household members); expressed in quartiles: M=mean; SD=standard deviation.

Moreover, those who did not live with their spouse, did not have a job, or did not have private insurance had lower HRQoL than those who did. In contrast, participants who engaged in perceived good subjective health, and no stress demonstrated higher HRQoL than those who did not (P<0.001).

Oral health-related characteristics and unmet dental needs in relation to HRQoL

For oral health, the EQ-5D index score was lower in older adults with tooth pain, chewing difficulties, speaking problems, and bad subjective oral health status than that of their counterparts (Table 2). The EQ-5D index score was higher for participants who attended oral examinations than those who did not. Furthermore, the EQ-5D index score was lower for participants with unmet dental care needs than those who did not (P<0.001).

Table 2: Oral health–related characteristics and unmet dental care needs in relation to the HRQoL among a sample of Korean older adults (n=24,269)

Classification			*N(%)*	*EQ-5D index*	
				M±SD	t~X2(p)
Oral health characteristics	Dental caries	0	1619(73.3)	0.88(0.16)	-0.34(0.73)
		≥ 1	589(26.7)	0.88(0.16)	
	Periodontal disease	Yes	881(49.1)	0.89(0.15)	-1.83(0.679)
		No	914((50.9)	0.88(0.15)	
	Tooth pain	Yes	853(38.6)	0.86(0.17)	4.29(<0.001)
		No	1335(61.4)	0.89(0.16)	
	Chewing difficulty	Inconvenient	2161(43.6)	0.84(0.18)	-9.06(<0.001)
		Not inconvenient	2795(56.4)	0.91(0.14)	
	Speaking problem	Inconvenient	1090(22.0)	0.82(0.20)	-7.57(<0.001)
		Not inconvenient	3866(78.0)	0.89(0.15)	
	Subjective oral health status	Good	1045(47.3)	0.90(0.15)	6.53(<0.001)
		Bad	1163(52.7)	0.86(0.17)	
	Oral examination	Yes	464(21.5)	0.91(0.13)	-5.56(<0.001)
		No	1691(78.5)	0.87(0.17)	
Unmet dental care need		Yes	283(33.8)	0.83(0.19)	-6.95(<0.001)
		No	2512(66.2)	0.89(0.14)	

M=mean; SD=standard deviation.

Factors associated with HRQoL in older adults

The multiple regression analysis included variables that demonstrated statistical significance in the difference analysis of demographic, health-related, and oral health-related characteristics in relation to HRQoL (Table 3). In regression model 1, the related factors of HRQoL were analyzed for the demographic and health-related characteristics that showed statistically significant differences in the difference analysis. Regression model 1 was found to be statistically significant (P<0.001). In regression model 2, we analyzed the factors associated with HRQoL by adding the oral-health related variables into regression model 1 and the 'unmet dental needs' variables that showed a statistically significant difference in the difference analysis. Regression model 2 was found to be statistically significant (P<0.001). In model 2, the HRQoL related factors identified in model 1 were equally significant, and additionally

male, no speaking problem, and no unmet dental care needs were associated with better HRQoL (Table 3).

Table 3: Factors associated with the HRQoL among a sample of Korean older adults (n=24,269)

Classification	***EQ-5D index***							
	Model 1				Model 2			
	ß	SE	t	*P*	ß	SE	t	*P*
Intercept	0.13	0.02	51.36	<0.001	1.076	0.04	26.93	<0.001
Male (vs. female)	0.02	0.01	1.95	0.069	0.03	0.01	3.55	0.032
≥ 75 age (vs. 65~74)	-0.04	0.01	-5.20	<0.001	-0.03	0.01	-4.44	<0.001
High school (vs. Elementary school)	0.03	0.01	2.87	0.004	0.02	0.01	2.15	0.032
Occupation (vs. no)	0.03	0.01	2.74	0.003	0.02	0.01	3.95	0.003
Living with a spouse (vs. no)	0.02	0.01	3.54	<0.001	0.02	0.01	2.09	0.037
Stress (vs. no)	-0.01	0.01	-8.61	<0.001	-0.06	0.01	-7.31	<0.001
Subjective health status (vs. bed)	0.07	0.01	15.47	<0.001	0.08	0.01	14.40	<0.001
Tooth pain (vs. yes)					0.01	0.01	1.72	0.085
Chewing difficulty (vs. .Inconvenient)					0.01	0.01	1.01	0.437
Speaking problem (vs. Inconvenient)					0.01	0.01	-2.83	0.005
Subjective oral health status (vs. bed)					0.01	0.01	0.25	0.880
Oral examination (vs. bed)					0.00	0.01	0.17	0.862
Unmet dental care need (vs. yes)					0.03	0.01	3.42	<0.001
F	69.87				37.98			
P-value	<0.001				<0.001			
R-Square	0.258				0.284			
Adj R-Sq	0.255				0.276			

SE=standard error.

Discussion

The present study confirmed the relation of oral health and unmet dental care needs on the HRQoL in older adults, aged over 65 yr using the 2019-2020 data from the KNHANES, a large-scale survey in South Korea.

The present study showed that male, under 75 yr of age, high level of education, employed, living with a spouse, no stress, and good subjective health status were significant factors associated with the HRQoL in the elderly. Lower socioeconomic status is associated with lower HRQoL (27). Engagement in paid work can improve physical health and mental satisfaction through social engagement, and living with social and economic stability promotes health behaviors and improves quality of life (28,29). Participation in economic activities was significantly association with an improved quality of life among older Koreans.

Older adults living together have a higher HRQoL or life satisfaction than the elderly living alone (30). This is consistent with the results of previous studies which demonstrated that living together rather than living alone has a positive effect on the HRQoL (31). On the contrary, other studies (32,33) have found that the presence or absence of a spouse to be associated with the HRQoL of elderly men, but not the elderly wom-

en. Further studies are needed to confirm these gender-specific differences.

Stress in old age is related to disease, economic difficulties, reduced social activities, etc., and are recognized as factors associated with the quality of life of the elderly (28,34). Our findings that the EQ-5D index score of older adults without stress was significantly lower than those with stress concurred with this observation. We also demonstrated that the better the subjective health status, the higher the quality of life; and in contrast, the higher the stress, the lower the quality of life. Subjective health status is also an important indicator in predicting the prevalence of physical, mental, and social diseases and mortality (35). It is supported by many studies as a major influencing factor in the HRQoL of the elderly, including vulnerable elderly people, such as those from low-income families and the elderly living alone (29).

In the present study, having speaking problems and unmet dental care needs were associated with worse HRQoL. These findings are consistent with the results of the present study. Tooth loss reduces the quality of meals and nutritional balance due to decreased masticatory ability, deteriorates pronunciation function and esthetics, and associate with general health due to discomfort and pain in daily life (2,10,13). In a previous study, dental problems or the loss of teeth due to oral diseases, such as periodontal disease and other causes, was negatively associated with the quality of life of individuals by causing chewing deteriorations and speaking problems (4,7). However, in previous studies, subjective perception of oral health and chewing discomfort were significantly associated with the HRQoL (13). This is also different from our results. In the future, studies to further examine the effects of oral health on HRQoL are necessary.

In previous studies, most of the reasons for unmet dental care needs were economic reasons. (15,19,36). Unmet health care needs have been associated with almost one-quarter of older adults in France, and were associated with age, poor socioeconomic conditions, depression, and low medical density (19). These oral health problems in the elderly are not limited to chewing or swallowing problems, but can be adversely associated with other diseases, and lead to a compromised self-image, limited social interaction, and thus, a reduced quality of life (36). The dental coverage from insurance is limited. That, together with limited social support and resources, has contributed to unmet dental care among older adults (18). If unsatisfied dental care occurs despite the need for dental treatment, health problems can arise, and in turn, HRQoL can be compromised (15). To reduce unmet dental care needs, it is necessary to identify vulnerable groups at risk of unmet dental care needs, investigate access to dental and medical services, develop health care policies and provide services to at-risk groups.

The present study also has some limitations. The details relating to the severity of chewing problems, chewing discomfort, and speaking problems were not available, hence the difference in HRQoL according to the severity of these conditions could not be determined. As a cross-sectional study, causal relationships could not be identified.

Despite these limitations, our study provides meaningful results because it identified not only the relation of oral health but also unmet dental care to the HRQoL of older adults in South Korea.

Conclusion

Oral health problems, such as speaking problems, and unmet dental care needs reduce HRQoL in older adults. In particular, unmet dental care needs can be linked to general health. Therefore, in order to improve the HRQoL of the elderly, it is necessary to minimize oral health problems through oral disease prevention and oral health education programs.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or fal-

sification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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