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Factors Influencing Quality of Sleep of Elderly Persons based on Theory of Unpleasant Symptoms: The 2018 Nationwide Community Health Survey in Korea

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Abstract

To identify factors influencing the quality of sleep and chewing discomfort of community-dwelling elderly individuals in South Korea based on the Theory of Unpleasant Symptoms (TOUS). This is a secondary data analysis using data collected from the 2018 Korea Community Health Survey. A total of 60,350 individuals aged 65-107 years (40.3% men) participated. Self-reported questionnaires regarding health status, stress, depression, chewing discomfort and quality of sleep were used. The data were performed using SPSS/WIN 24.0 program to perform independent t-test, x2-test, one-way ANOVA, and regression analysis. The regression model had an adjusted R^2 of 28%, indicating that the gender, health status, depression, stress, educational level, marital status, and symptom of chewing difficulty were significant predictors of the quality of sleep for the elderly. As for the quality of sleep for elderly people, the experience of chewing difficulty was found to be an influencing factor. Sleep and the oral health of elderly people are closely related with each other. Therefore, to improve the quality of sleep, oral health needs to be managed as well.

Keywords: Quality of sleep, Elderly, Chewing difficulty, Theory of unpleasant symptoms, Secondary data analysis

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Introduction

South Korea has rapidly become an aging society as the average life expectancy was extended due to the improvement of medical technology. The increase in the elderly population causes a problem of the burden of medical expenses at the national level and the problem of the burden of support at home. Therefore, attention should be paid to the overall health care of the elderly who experience a greater variety of health problems compared to adults, and furthermore, ways to live a successful aging life should be sought. In particular, sleep is the most important element in maintaining health because it maintains physical and mental health and plays an important role in recovery and immunity. However, due to changes in sleep structure resulting from aging, the incidence of sleep disorders among the elderly is 29.2%, which is about two times that of adults at 16.6% (Cho *et al.*, 2009). Factors related to the sleep quality of the elderly that have been identified thus far are general characteristics such as female, age, divorce, and education level, psychological factors such as suicidal thoughts and depression, and physical factors such as the number of chronic diseases and health status (Moon *et al.*, 2017; Han *et al.*, 2019). In particular, sleep quality deterioration in the elderly increases the incidence of inflammation, thereby increasing the incidence of diseases such as arthritis, cerebrovascular disease, and heart disease, and lowering cognitive functions and the quality of life (Gómez-Esteban*et al.*, 2011). Therefore, sleep quality is an important issue that affects the health of the elderly.

Several recent papers report oral health as a factor related to sleep quality in the elderly. Kim et al stated that if the sleeping time of the elderly increases to more than 9 hours (Kim *et al.*, 2019), the risk of reduction in the number of existing teeth to less than 20 is 1.41 times higher. Carra et alreported that the prevalence of dental caries and periodontal disease was higher in the elderly with less than 5 hours of sleep or more than 9 hours of sleep compared to the elderly with an average sleeping time of 7 hours. According to this study, it can be seen that sleep affects not only the physical and psychological health of the elderly, but also oral health. On reviewing the oral health problems of the elderly, it was found that the elderly experience various symptoms such as tooth loss, oral pain, dry mouth, and periodontal disease, and in particular, the proportion of the elderly complaining of chewing discomfort is high at 20-46.3% (Moon *et al.*, 2017). This is proved by the connection of the deterioration in sleep quality with increased fatigue, leading to the deterioration of health, and increases in gingival inflammation and alveolar bone loss (Gómez-Esteban*et al.*, 2011), but studies examining the factors that affect chewing discomfort symptoms and sleep quality are still insufficient.

Therefore, this study is intended to understand the factors affecting the symptoms of chewing

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discomfort and the sleep quality of the elderly by reflecting the physiological, psychological, and situational aspects among the components of the theory of unpleasant symptoms(TOUS) of Lenz et al (Lenz *et al.*, 1995). In this study, Lenz et al.'s theory of discomfort symptoms will be applied as the entire components of the conceptual framework used to identify the quality of sleep of the elderly and the factors that affect it.Through this study, it will be used as foundation data for the development of nursing intervention that can improve the sleep quality of the elderly residing in the community.

Materials and Methods

Study design

This study is a cross-sectional study that secondarily analyzed data from the Community Health Survey (CHS) to identify the symptoms of chewing discomfort and factors affecting the quality of sleep of the elderly residing in the community based on the TOUS.

Sample

This study used the 2018 Community Health Survey, which was conducted with 228,340 adults over the age of 19. Of the subjects, 72,388 subjects aged 65 or older were first selected for this study, and 60,350 subjects were selected as final subjects, excluding 12,038 subjects with missing values in the response results.

Measures

General characteristics

The demographic characteristics of this study include age, gender, marital status, educational level, and whether economic activities are conducted.

Health status

For health status, a 5-point scale was used to evaluate this self-reported item to answer the question, “How do you feel about your health?” One point was given for “very good,” and 5 points were given for “very bad.” Higher scores mean poorer health.

Stress

For stress, a 4-point scale was used to assess this self-reported item to answer the question, “How much stress do you feel in your daily life?” One point was given for “I feel stress very much,” and 4 points were given for “I hardly feel stress”. Lower scores mean severer stress.

Depression

To evaluate the depression, patient health questionnaire-9 (PHQ-9) was developed in 1999 by Spitzer et al. This tool, translated into a Korean version by Han et al, was used in this study. It consists of a total of nine items, and each item is calculated as 0-3 points so that the full score is 27 points. Higher scores mean higher levels of depression.

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Chewing discomfort

For the experience of chewing discomfort, a 5-point scale was used to evaluate this self-reported item to answer the question, "Are you currently experiencing difficulty or discomfort in chewing food due to problems in your mouth such as teeth, dentures, or gums?" One point was given for "very uncomfortable" and 5 points were given for "not at all uncomfortable". Lower scores mean higher levels of chewing discomfort.

Quality of sleep

To evaluate the quality of sleep, we used Pittsburgh Sleep Quality Index (PSQI), developed by Buysse et al. Tools translated by Cho consist of a total of 10 items on a four-point scale. Each item is scored as 0 to 3 points, and the sleep index is in a range from 0 to 21 points. Higher scores mean lower quality of sleep. Cases where the total score is 5 or lower are classified into "good quality of sleep" and cases where the total score exceeds 5 are classified into "poor quality of sleep."

Conceptual framework

The conceptual framework of this study is as shown in Figure 1. Among the constituent factors of the TOUS, physiological factors were composed of age, sex, and health status, psychological factors were composed of depression and stress, situational factors were composed of education level and living with a spouse, the symptom factor was composed of chewing discomfort symptoms, and the symptom experience factor was composed of sleep quality.

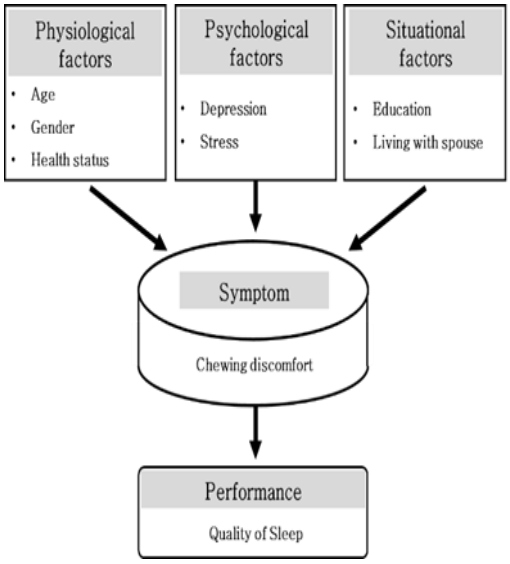

Figure 1: Conceptual framework of this study

Data analysis

IBM SPSS Statistics 24.0 was used for the analyses in this study. The frequency, percentage, mean and standard deviation were calculated for the analysis of the differences in the general

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characteristics and main variables between the good sleep quality group and the poor sleep quality group among the elderly residing in the community, and χ 2 -test, t-test and ANOVA were performed. In addition, through multiple regression analysis, the effect of the variables presented in the conceptual framework on the sleep quality of the elderly residing in the community.

Ethical considerations

A pledge was written to use the data, consents were received for the collection and use of personal information, a data use plan was written, a process to request the data was undergone, and approval for the use of the data was received. Thereafter, the approval of exemption from deliberation was received from the institutional bioethics committee of E University (EUN20-013) before the study was conducted.

Results and Discussion

General characteristics

The general characteristics of this study showed in Table 1.Of the total of 60,350 subjects in this study, 24,342 (40.3%) were males and 36,008 (59.7%) were females, and the average age was 74.60±6.52 years. The group with good sleeper consisted of 34,377 subjects (56.9%) and the group with poor sleeper consisted of 25,973 subjects (43.1%). The results of analysis of general characteristics analysis are as shown in Table 1. As for the quality of sleep according to general characteristics, there were statistically significant differences between the two groups in gender, age, education level, marital status, and economic activity. In the group with poor sleeper, as for gender, the ratio of females (68.9%) was higher than that of males (31.3%)(χ2=-40.81, p <.001); as for age, the ratio of 70 to 79 years (49.9%) was the highest and that of 65-69 years (23.4%) was the lowest (χ2=388.46, p <. 001); as for education level, the ratio of not higher than elementary school graduation (68.1%) was the highest (χ2=913.64, p <. 001); as for marital status, the ratio of living with a spouse (54.6%) was higher than that of living without a spouse (45.4%) (χ2=31.55, p <. 001); and as for economic activity, the ratio of not conducting economic activities (70.9%) was higher (χ2=-24.54, p <. 001).

Health status, depression, stress, chewing discomfort, and sleep quality level of subjects

Table 2 showed the quality of sleep according to health-related characteristics.There werea statistically significant difference in all variables between the group with good sleeper and the group with poor sleeper. First, the average health status level of the poor sleeper group was lower because the score was shown to be 3.52±.93, while the score for the good sleeper group

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was 3.05±.91(p <.001). The level of depression was much higher in the poor sleeper group since the score was 1.50±2.36 in the good sleeper group and 4.57±4.75 in the poor sleeper group (*p*<. 001). The stress level was higher in the poor sleeper group because their score was 2.99±.85 while it was 3.34±.70 in the good sleeper group (*p*<.001). The level of chewing discomfort was shown to be higher in the poor sleeper group since the score was 2.81±1.32 while the score in in the good sleeper group was 3.26±1.30(*p*<.001).

Factors Influencing quality of sleep

Table 3 showed the results of analysis of factors affecting the sleep quality of the elderly. The regression model was statistically significant (F=2732.28, *p*<.001). The factors affecting the sleep quality of the elderly residing in the community were analyzed based on the TOUS and according to the results, statistically significant variables were gender (β=.66, *p*<.001), health status (β=.35, *p*<. 001), depression (β=.38, *p*<.001), stress (β=-.40, *p*<.001), education level (β=-.04, *p*<.001), marital status (β= .32, *p*<.001), and chewing discomfort (β=-.11, *p*<.001), and the explanatory power was 28%. That is, it was shown that the quality of sleep of the elderly was lower among females than among males, when the health status was worse, when the levels of depression and stress were higher, when the level of education was lower, when living with a spouse, and when the level of chewing discomfort was higher.

Table 1: General Characteristics of the Subjects *(N=60,350)*

Characteristics	Categories	Good sleeper PSQI≤5(n=34,377)	Bad sleeper PSQI >5(n=25,973)	χ^2 or t	p
Gender	Male	16,268(47.3)	8,074(31.1)	-40.81	<.001
	Female	18,109(52.7)	17,899(68.9)		
Age (year)	65-69	10,059(29.3)	6,086(23.4)	388.46	<.001
	70-79	17,076(49.6)	12,950(49.9)		
	≥80	7,242(21.1)	6,937(26.7)		
Education	≤Elementary school	19,537(56.8)	17,677(68.1)	913.64	<.001
	Middle school	5,731(16.7)	3,780(14.6)		
	High school	5,985(17.4)	3,175(12.2)		
	≥College	3,124(9.1)	1,341(5.1)		
Marital status	With spouse	23,082(67.1)	14,195(54.6)	-31.55	<.001
	Without spouse	11,280(32.9)	11,769(45.4)		
Economic activity	Yes	13,278(38.6)	7,546(29.1)	-24.54	<.001
	No	21,096(61.4)	18,420(70.9)		

PSQI: Pittsburgh Sleep Quality Index

Table 2: Health Status, Depression, Stress, Chewing Difficulty and Quality of Sleep*(N=60,350)*

Variables	Good sleeper (n=34,377) M±SD	Bad sleeper(n=25,973) M±SD	t	p

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Health status	3.05±.91	3.52±.93	-61.82	<.001
Depression	1.50±2.36	4.57±4.75	-103.81	<.001
Stress	3.34±.70	2.99±.85	55.89	<.001
Chewing difficulty	3.26±1.30	2.81±1.32	42.28	.010
Quality of sleep	3.14±1.29	9.11±2.79	-350.24	<.001

Table 3: Factors Influencing Quality of Sleep *(N=60,350)*

Variables	***Categories***	***Model I***		
		β	**SE**	***p***
Physiological factors	Age	-.01	.002	.432
	Gender	.66	.029	*<.001*
	Health status	.35	.015	*<.001*
Psychological factors	Depression	.38	.004	*<.001*
	Stress	-.40	.018	*<.001*
Situational factors	Education	-.04	.014	.015
	Marital status	.32	.029	*<.001*
Symptomatic factors	Chewing discomfort	-.11	.010	*<.001*
F(p)			2732.28	
R^2			.29	
Adjusted R^2 .			.28	

Discussion

This study was conducted to investigate the factors affecting the chewing discomfort and quality of sleep of the elderly living in the community based on the TOUS of Lenz et al (Lenze*et al.*, 1995) using the 2018 Community Health Survey. According to the results of the study, the factors affecting the sleep quality of the elderly were gender and health status among physiological factors, depression and stress among psychological factors, education level and living with a spouse among situational factors, and chewing discomfort among symptomatic factors. Therefore, according to this study, the factors that affect the sleep quality of the elderly in the community will be discussed.

As for gender among physiological factors, the quality of sleep was lower among females than among males. The reasons for the lower sleep quality among females were shown to be cultural differences in emotional expression and factors such as menopause, depression, and anxiety (Zhang *et al.*, 2006). Poor health statuses were found to be a factor affecting sleep quality. Hayashino et alreported that the number of comorbidities increased as the score on the Pittsburgh Sleep Quality Scale increased. The number of chronic diseases (hypertension, diabetes, hyperlipidemia, osteoarthritis) was shown to be higher in the elderly with poor sleep quality. In particular, the number of visits to the toilet at night was reported to be at least three per week for the elderly. Consequently, nocturia should be considered among health status (Li *et al.*, 2013). Therefore, it can be seen that health status is a major factor affecting the quality of sleep of the

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elderly. Strategies to reduce nocturia symptoms in the elderly complaining of poor sleep quality will help improve sleep quality, and changes in the health status such as chronic diseases should be carefully observed.

Among psychological factors, depression and stress were found to have significant effects on sleep quality. In old age, people experience many psychological and social changes while experiencing retirement, bereavement, and physical weakness (Ahn*et al.*, 2015). These changes affect the elderly's emotions, and indeed, depression in old age appears to be a very common psychological problem (Jeong *et al.*, 2017). However, depression is considered one of the symptoms that naturally appear in the process of aging, and the severity is highly likely to be ignored. Depression is one of the symptoms in the elderly that should not be overlooked because it causes problems in the start and maintenance of sleep (Ahn*et al.*, 2015), leading to changes and disorders in sleep (Jeong Ahn*et al.*, 2017). In particular, since the occurrence of depressive symptoms is a cause of poor sleep quality in the elderly, community nurses should detect signs of depression early in the case of the elderly with poor sleep quality. Stress does not make the person completely awake from sleep, but increases arousal and lowers his/her overall sleep quality(Han *et al.*, 2019). Therefore, in order to improve the quality of sleep, it is necessary to develop stress interventions that enable the elderly to cope with the stress that occurs in daily life. In particular, stress management is believed to be helpful not only for the improvement of sleep quality, but also for physical health by strengthening immunity.

Among situational factors, low education levels and living with a spouse were found to have significant effects on the quality of sleep. A study conducted with the elderly in the community indicated that the lower the educational level, the worse the sleep quality, thereby supporting the results of this study (Li *et al.*, 2013). In a study that surveyed marriage and sleep with 727 subjects aged 62-90 years, the elderly who reported negative aspects of their marital relationships reported more symptoms of sleep disorders such as insomnia, and those who reported positively about their marital relationships were shown to be at higher levels of not only sleep quality, but also physical and mental health compared to unmarried subjects (Chen *et al.*, 2015). Therefore, additional studies on intimacy in marital relationships are considered necessary in relation to the reason why the quality of sleep is lower among the elderly living with their spouse.

Among symptomatic factors, chewing discomfort was found to be an influencing factor that lowered the quality of sleep. Although a direct comparison is difficult because previous studies on the relationship between chewing discomfort and sleep quality in the elderly are insufficient, since chewing problems were shown to be a risk factor that deteriorates the quality of sleep in adults, it was reported that improving the health of teeth to reduce chewing problems would improve the quality of sleep (Azuma *et al.*, 2019). The mechanism for the correlation between sleep quality

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deterioration and chewing discomfort is still unknown. Garaulet et al (Garaulet*et al.*, 2011) reported that inadequate eating habits increased the risk of sleep problems due to chewing discomfort, and Tasaka et al (Tasaka*et al.*, 2018) reported that since chewing ability was related to the level of cortisol, which is called the stress hormone, chewing problems were a cause of harm to mental health. Poor oral conditions can lead to an imbalance in nutritional intake and digestive disorders, can negatively affect physical health, and can even cause mental disturbances such as the stress of eating restrictions, social phobia, and loss of confidence (Jang *et al.*, 2011).It can be seen that chewing discomfort plays an important role in maintaining general health such as nutrition, mental health, and sleep of the elderly. Therefore, the quality of sleep for the elderly living in the community can be improved through the development of sleep intervention programs that take into physiological, psychological, and situational factors affecting sleep quality and the symptoms of chewing discomfort.

The limitation of this study is that since it is a secondary analysis study using the data collected from the Community Health Survey, only those variables included in the data collection of the original survey were used. It is necessary to identify the influencing factors among factors other than the independent variables included in this study in the future.

Conclusion

According to the results of this study, the ratio of deterioration of sleep quality of the elderly in South Korea was shown to be high at 43.1%, and the main predictors for the deterioration of sleep quality were females, poor health conditions, depression, stress, low education level, living with a spouse, and chewing discomfort. For the health care of the elderly residing in the community, sleep health education should be provided, and interventions aimed at behavioral change to reduce depression and stress should also be conducted. Therefore, according to this study, it is suggested to promote and educate the elderly on oral health contents such as chewing discomfort by including them when developing a sleep intervention program to improve the sleep quality of the elderly.

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