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Association between Overall Quality of Sleep and Mental Health

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ABSTRACT

Sleep is not only rest but a process of recovering the body and mind for the next day's normal activities. However, as modern society becomes more complex and diverse, human activity time has naturally been extended, leading to sleeplessness. Therefore, this empirical study aimed to identify the link between the quality of sleep and subjective health, stress, and depression.

In this study, the 2018 Korea Community Health Survey (KCHS) was used to analyzed 226,328 participants excluding missing values among the 19 years or older groups. Frequency analysis, chi-squared test, and logistic regression were used to identify the association of subjective health, stress experiences, and depression experiences with subjective sleep quality.

The subjective health condition of people who reported very poor quality of sleep was worse than those who reported very good quality of sleep. Moreover, the former experienced more stress and more depression experiences compared with the latter. Our results confirmed that the deterioration of sleep quality can lead to the deterioration of subjective health and mental health.

Improving the quality of sleep is an indispensable factor in maintaining and recovering good quality of life and mental health. A nationwide health education campaign is essential to promoting adequate sleep quality. Moreover, sleep quality improvement programs that focus on mental health promotion need to be developed.

1. Introduction

With the increasing number of night activities, such as internet browsing, and the expansion of entertainment culture, as modern society becomes more complex and diverse, human activity time has been extended. Indeed, many people live in an environment in which they have to control

sleep time on their own (Gangwisch et al., 2005). For example, many office workers are unable to get adequate sleep owing to frequent overtime work or increased stress from mental pressure (Kim, 2014; Kim & Wang, 1998). Studies on changes in sleep time have shown that human sleep time was getting shorter and shorter (Gangwisch et al., 2008; Lee & Kim, 2003; Knutson et al., 2010). However, Sleep is an essential component of and fundamental need for good health, and it is reported as an important determinant of physical and mental health (Nilsson et al., 2001), affecting individual well-being and quality of life (Jensen & Herr, 1993). Sleep is also seen as a compulsory recharging process for brain recovery (Kim, 1989; Webb & Agnew, 1975) that provides time to eliminate unpleasant memories and compensate for energy lost to daytime activities (Charles et al., 1979; Webb & Agnew, 1975). In other words, sleep is not only rest but a process of recovering the body and mind for the next day's normal activities. The physiological and mental changes that occur during normal sleep enable the body to be integrated. Therefore, Insufficient sleep or poor sleep quality can lead to physical problems, such as headaches, fatigue, decreased activity, and daytime sleepiness, or emotional difficulties, such as anxiety and depression (Buysse et al., 1998).

Like this, sleep-related abnormal physiological phenomena that are due to poor sleep or poor sleep quality are called sleep disorders, and the most common emotional disorder is insomnia (Min, 2015; Coleman, 1982; LeBlanc et al., 2007).

According to the sleep deprivation period, it can be divided into short-term sleep deprivation and long-term sleep deprivation. In the case of short-term sleep deprivation, it leads to the psychological and social phenomena of fatigue, confusion, instability, and concentration disorders, and long-term sleep deprivation leads to dizziness, intellectual disability, victimization consciousness, attention disorder, sensory disorders, and temporary hand tremors (Baker, 1985). Thus, it can be seen that sleep disturbance can cause physical and mental disorders (Wilson, 2005), and the quality of sleep is closely related to subjective of physical and mental health conditions (Doi, Minowa, & Tango, 2003; Strine & Chapman, 2005).

According to a previous study about a 10-year study on sleep patterns and lifestyle in Japan, Ishihara et al. (1987) showed that sleep has a significant impact on health and quality of life (Ishihara et al., 1987). This is expected to have a significant impact on quality of life as sleep quality restores and maintains cognitive functions such as mental fatigue and memory (Gangwisch et al., 2005). Therefore, degraded sleep quality can lead to a deterioration of subjective health conditions (Magee, Caputi, & Iverson, 2011).

As a result of examining factors influencing this to improve the quality of sleep, studies have identified the results of stress affecting the quality of sleep (Kim & Song, 2007) and have shown that physical and mental stress are common factors affecting the quality of sleep (Kim, Song, & Yeon, 2009).

Also, people who do not have enough quality sleep have high levels of awakening and excitement before going to bed, and are affected by various life stresses (Harvey, 2000; Morin, Rodrigue, & Ivers, 2003). People with insomnia tend to be very stress (LeBlanc et al., 2007; Morin et al., 2003), and this recognition of stress affects sleep time and quality of sleep (Charles et al., 2011; El-Sheikh, Erath, & Keller, 2007) as well as subjective and psychological well-being negatively

(Hamilton et al., 2007).

Such as this, factors related to anxiety and stress are directly linked to the pain of sleep (Guilleminault & Lugaresi, 1983).

Meanwhile, clinical groups frequently report various psychiatric disorders, including depression and anxiety disorder (Buysse et al., 1998). In a study of factors related to the quality of sleep (Haseli-Mashhadi et al., 2009), Haseli-Mashhadi et al. (2009) reported depression as the most powerful factor. Insomnia and depression that are caused by short sleep hours are bi-directional; as such, insomnia is both a risk factor and a result of depression (Lustberg & Reynolds, 2000).

The literature has shown that the quality of sleep has a significant effect on physical and mental health. However, research that directly relates sleep quality to subjective health conditions, stress, and depression in adults is insufficient. This study aimed to analyze what sleep quality means to subjective health, stress, and depression. In addition, by dividing the study into four layers by sex and age, the study sought to determine differences between subgroups and derive the importance of sleep quality. This study presents distinctiveness from previous research by measuring the overall quality of individual sleep to determine its association with self-rated health (SRH) and depression, and furthermore, by investigating the influence of gender and age on these factors.

2. Methods

2.1 Data and subjects

2.1.1 Data source

This empirical research was conducted to determine the quality of sleep in Korean adults and to analyze the effects of sleep quality on physical and mental health. This secondary analysis study used raw data from the 2018 Community Health Survey. This survey has been conducted annually since 2008 according to Article 4 of the Regional Health Act and Article 2 of the Enforcement Decree of the same Act. As of July 2018, the survey recruited participants aged 19 years or older living in cities, counties, and districts. The survey population is based on the number of households by type of housing in Tong/Ban/Ri as the primary extraction unit.

The number of households in the selected Tong/Ban/Ri is identified and selected by the system extraction method and subsequently extracted. The data are collected in 1:1 interviews (electronic questionnaire) using a laptop equipped with a survey program by a trained researcher visiting the sample households. This study was conducted using data of 228,340 adults aged 19 years or older from the raw data of the 2018 Community Health Survey.

We used a final sample of 226,328 participants, after excluding non-responders and those with missing responses for variables on overall quality of sleep, self-rated health, self-rated stress, depression status, sex, age, economic status, smoking history, alcohol history, occupation, marital status, sleep disorders, taking medicine for sleep, degree of sleepiness in social activities, and sleep duration.

2.1.2 Independent variables

2.1.2.1 Overall quality of sleep

The overall quality of sleep was investigated by the question, “How do you rate your overall quality of sleep for the past month?”. The responses were “very good”, “good”, “bad”, and “very bad”. The overall quality of sleep was divided into four groups; “very good”, “good”, “bad”, and “very bad”.

2.1.3 Dependent variables

2.1.3.1 Self-rated health

Self-rated health was investigated by the question, “How do you usually feel about your health?”. The responses were “very good”, “good”, “normal”, “bad”, and “very bad”. In this study, “very good” and “good” were grouped into “good”, whereas “bad” and “very bad” were grouped into “bad”. Finally, we reclassified the self-rated health variables as “good”, “normal” and “bad”.

2.1.3.2 Self-rated stress

Self-rated stress was investigated by the question, “How much stress do you feel in your daily life?”. The choices were “feel a great deal”, “tend to feel a lot”, “feel a little bit”, and “hardly any”. We grouped “feel a great deal” and “tend to feel a lot” into “yes”, and grouped “feel a little bit” and “hardly any” into “no”.

2.1.3.3 Experienced depression

Experience of depression was surveyed by the question, “Have you ever felt sad or hopeless enough to disrupt your daily life for more than two weeks in a row in the last year?”. The participants responded “yes” or “no”.

2.1.4 Contingency

2.1.4.1 Social demographic variables

We collected data on the participants’ sex, age, economic status, occupation, and marital status. Sex was classified as “male” or “female”, and age was classified as “19–29 years”, “30–39 years”, “40–49 years”, “50–59 years”, “60–69 years” and “70 years or older”. Economic status was classified as “yes” or “no”. Occupations were classified into three categories: “white-collar”, “blue-collar”, and “other (career soldier, housewife, student, etc.)”. Marital status was classified as “married”, “divorced”, “separated”, and “unmarried”.

2.1.4.2 Health-related characteristics

The study used information of participants’ health-related characteristics: smoking history, sleep disorders, taking medicine for sleep, degree of sleepiness in social activities, and sleep duration. Smoking history and alcohol history were classified as “yes” or “no”. Sleep disorders were investigated

by the question, “How often have you been suffering from symptoms of bad sleep, having difficulty falling asleep, constantly waking up, or sleeping too much in the past two weeks?”. The responses were “not at all”, “for many days”, “more than a week”, and “almost daily”. Taking medicine for sleep and the degree of sleepiness in social activities were classified as “not in the past month”, “less than once a week”, “about one to two times a week”, and “more than three times a week”. Sleep duration was classified into “less than six hours”, “seven hours”, “eight hours”, and “more than nine hours”.

2.2 Analysis

The collected data were used for analyses, and statistical significance was set at a P-value of ≤ 0.05. The analyses were based on a complex sample analysis model that accounted for stratification variables, colony variables, and weights. Frequency analysis and a chi-squared test were conducted to determine the self-rated health, self-rated stress, depression status, social demographic variables and level of health-related activities according to overall quality of sleep.

The relation between self-rated health, self-rated stress, and depression status according to the quality of sleep was analyzed, and then logistic regression analysis was applied for the variables that showed significant relevance.

3. Results

3.1 General characteristics of the participants

As shown in Table 1, of the 226,328 people surveyed, 3.0% (n = 8,153) and 19.3% (n = 45,276 people) reported very poor and poor quality of sleep, respectively. In addition, 14.6% (n = 46,232) of the participants reported poor subjective health, 25.8% (n = 52,853) felt stress, and 5.9% (n = 13,074) said they had experienced depression.

Of the 8,153 people who said their sleep quality was very bad, 51.4% (n = 4,769 people) reported bad subjective health, 58.9% (n = 4,419 people) felt stress, and 28.5% (n = 2,078 people) said they had experienced depression.

According to demographic characteristics, out of 101,142 (49.6%) men and 124,886 (50.4%) women, more women (17.1%, n = 29,565) reported worse subjective health compared with men (12.1%, n = 16,667). More women also reported higher stress (26.0%, n = 29,981) and depression (7.5%, n = 8,083) compared with men (stress: 25.6%, n = 22,872; depression: 4.2%, n = 8,991).

Of the 5,107 people who said they took medication more than three times a week to fall asleep, 53.5% (n = 3,030) reported poor subjective health, 48.4% (n = 2,267) reported feeling stress, and 33.2% (n = 1,430) said they had experienced depression.

Table 1. General characteristics of subjects included for analysis

Variables	Total		Self-related health Bad			Self-related stress Feel			Experienced depression Yes		
	N	%*	N	%*	P-value	N	%*	P-value	N	%*	P-value
Overall quality of sleep					<.0001			<.0001			<.0001
Very good	32,630	14.0	3,693	7.3		4,611	16.0		852	2.6	
Good	140,269	63.7	21,456	10.5		26,496	21.4		4,914	3.6	
Bad	45,276	19.3	16,314	27.7		17,327	42.4		5,230	12.3	
Very bad	8,153	3.0	4,769	51.4		4,419	58.9		2,078	28.5	
Self-related health								<.0001			<.0001
Good	180,096	85.4				37,061	23.5		7,178	4.3	
Bad	46,232	14.6				15,792	39.5		5,896	15.0	
Self-related stress					<.0001						<.0001
Feel	52,853	25.8	15,792	22.4					8,004	14.3	
Not feel	173,475	74.2	30,440	11.9					5,070	3.0	
Experienced depression					<.0001			<.0001			
Yes	13,074	5.9	5,896	37.3		8,004	62.7				
No	213,254	94.1	40,336	13.2		44,849	23.5				
Almost everyday	17,133	6.4	7,972	39.9		7,380	47.2		3,389	22.7	
The degree of sleepiness in social activities					<.0001			<.0001			<.0001
Not in last month	167,461	70.3	32,659	13.4		34,140	22.4		7,547	4.5	
Less than once a week	20,467	10.1	4,026	13.9		5,469	28.4		1,351	6.3	
1-2 a week	24,776	12.7	5,181	15.7		7,745	33.2		2,164	8.5	
More than 3 times a week	13,624	6.8	4,366	25.8		5,499	43.4		2,012	14.8	
Sleep duration					<.0001			<.0001			<.0001
Under 6hours	97,207	44.3	21,438	16.3		27,111	30.4		6,774	7.1	
7 hours	73,238	33.4	11,617	11.1		14,865	22.6		3,105	4.3	
8 hours	44,239	18.0	9,174	14.6		8,403	21.3		2,267	5.4	
Over 9 hours	11,644	4.3	4,003	25.0		2,474	22.8		928	7.9	
Sex					<.0001			0.1789			<.0001
Male	101,142	49.6	16,667	12.1		22,872	25.6		4,083	4.2	
Female	124,886	50.4	29,565	17.1		29,981	26.0		8,991	7.5	
Age					<.0001			<.0001			<.0001
19-29	23,353	17.5	1,388	5.9		6,308	27.3		1,147	5.1	
30-39	28,096	17.0	2,010	7.2		8,914	32.7		1,434	5.2	
40-49	36,642	20.0	3,319	8.6		10,317	29.4		1,835	5.2	
50-59	44,170	20.0	6,450	13.4		10,226	24.0		2,490	6.0	
60-69	42,274	12.9	10,293	22.0		8,088	19.6		2,596	6.9	
70-	51,793	12.6	22,772	40.5		9,000	18.0		3,572	7.9	
Economic status					<.0001			<.0001			<.0001
Yes	139,612	63.7	18,726	9.4		34,845	28.0		5,983	4.6	
No	86,716	36.4	27,506	23.6		18,008	22.0		7,091	5.2	
Smoking status					0.4929			<.0001			0.0122
Yes	80,409	37.3	15,261	14.5		20,065	28.4		4,282	5.7	
No	145,919	62.7	30,971	14.7		32,788	24.2		8,792	6.0	
Alcohol status					<.0001			<.0001			0.0446
Yes	188,035	88.2	33,613	13.1		45,201	26.3		10,719	5.8	
No	38,293	11.8	12,619	25.7		7,652	21.8		2,355	6.2	
Occupation					<.0001			<.0001			<.0001
White color	71,347	40.6	6,195	7.5		20,876	30.7		3,182	4.6	
Blue color	67,524	22.7	12,509	87.0		13,812	23.3		2,783	4.5	
Etc.(Professional soldier, Housewife, Student etc)	87,457	36.7	27,528	23.4		18,165	21.9		7,109	8.2	
Married status					<.0001			<.0001			<.0001
Live with spouse	151,998	64.6	28,376	14.0		34,860	25.3		7,286	5.1	
Divorce	8,837	3.9	2,132	22.4		2,754	32.8		1,092	13.3	
Bereavement	28,063	7.0	12,221	38.8		4,994	19.0		2,579	10.8	
Separation	3,092	1.2	619	18.8		812	29.1		288	9.6	
Single	34,338	23.3	2,884	7.4		9,433	27.9		1,829	5.2	
total	226,328	100.0	46,232	29.310		52,853	29.076		13,074	11.804	

3.2 Association between subjective sleep quality and subjective health conditions, subjective stress experience, and depression experience

As shown in Table 2, the subjective health condition of the respondents who reported very bad quality of sleep was 4.535 times (95% CI: 4.132−4.977, p-value: <.0001) worse than those who reported very good quality of sleep. For this analysis, we controlled for the influencing factors of drug use, insomnia, sleepiness in social activities, sleep duration, sex, age, economic status, occupation, drinking history, smoking history, subjective stress experience, and depression experience.

An analysis of the relevance of the stress experience to the subjective quality of sleep showed that those with very bad quality of sleep experienced stress 3.713 times (95% CI: 3.417−4.035, p-value: <.0001) more than those with very good quality of sleep. For this analysis, we controlled for the influencing factors of drug use, insomnia, sleepiness in social activities, sleep duration, sex, age, economic status, occupation, drinking history, smoking history, subjective health condition, and depression experience.

According to an analysis of the association between depression experience based on subjective sleep quality, those who had very bad sleep quality experienced depression 2.011 times (95% CI: 1.767−2.288, p-value: <.0001) more than those who had very good quality of sleep. We controlled for the effects of drug use, insomnia, sleepiness in social activities, sleep duration, sex, age, economic status, occupation, drinking history, smoking history, subjective health condition, and subjective stress experience.

Table 2. Adjusted effect between overall quality of sleep and health outcome

Variables	Self-related health condition (Bad)				Self-related stress (Feel)				Experienced depression (Yes)			
	OR	95% CI		P-value	OR	95% CI		P-value	OR	95% CI		P-value
Overall quality of sleep												
Very good	1.000				1.000				1.000			
Good	1.351	1.277	1.430	<.0001	1.322	1.264	1.383	<.0001	1.059	0.959	1.169	0.2582
Bad	2.810	2.635	2.996	<.0001	2.499	2.370	2.635	<.0001	1.445	1.298	1.608	<.0001
Very bad	4.535	4.132	4.977	<.0001	3.713	3.417	4.035	<.0001	2.011	1.767	2.288	<.0001
Self-related health												
Good					1.000	0.432	0.473		1.000			
Bad					2.033	1.957	2.111	<.0001	1.654	1.559	1.755	<.0001
Self-related stress												
Feel	2.050	1.974	2.129	<.0001					3.577	3.390	3.773	<.0001
Not feel	1.000								1.000			
Experienced depression												
Yes	1.634	1.540	1.733	<.0001	3.532	3.346	3.727	<.0001				
No	1.000				1.000							
The degree of sleepiness in social activities												
Not in last month	1.000				1.000				1.000			
Less than once a week	1.060	1.002	1.122	0.0418	1.101	1.051	1.152	<.0001	1.163	1.070	1.265	0.0004
1-2 a week	1.150	1.094	1.210	<.0001	1.197	1.150	1.246	<.0001	1.356	1.264	1.455	<.0001
More than 3 times a week	1.524	1.435	1.619	<.0001	1.468	1.392	1.548	<.0001	1.645	1.514	1.766	<.0001
Sleep duration												
Under 6hours	0.518	0.484	0.540	<.0001	1.302	1.212	1.398	<.0001	0.817	0.736	0.908	0.0002
7 hours	0.538	0.502	0.577	<.0001	1.048	0.975	1.127	0.2042	0.803	0.720	0.897	<.0001
8 hours	0.649	0.605	0.697	<.0001	1.002	0.929	1.080	0.9653	0.933	0.831	1.046	0.2340
Over 9 hours	1.000				1.000				1.000			

Variables	Self-related health condition (Bad)				Self-related stress (Feel)				Experienced depression (Yes)			
	OR	95% CI		P-value	OR	95% CI		P-value	OR	95% CI		P-value
Sex												
Male	1.000				1.000				1.000			
Female	1.175	1.116	1.236	<.0001	1.066	1.025	1.108	0.0014	1.626	1.504	1.758	<.0001
Age												
19-29	0.100	0.091	0.111	<.0001	2.897	2.690	3.119	<.0001	1.174	1.020	1.351	0.0252
30-39	0.150	0.140	0.162	<.0001	3.037	2.860	3.224	<.0001	1.260	1.126	1.409	<.0001
40-49	0.215	0.202	0.229	<.0001	2.488	2.349	2.635	<.0001	1.386	1.249	1.539	<.0001
50-59	0.338	0.321	0.356	<.0001	1.732	1.639	1.832	<.0001	1.467	1.330	1.617	<.0001
60-69	0.527	0.504	0.551	<.0001	1.273	1.207	1.343	<.0001	1.341	1.227	1.466	<.0001
70-	1.000				1.000				1.000			
Economic status												
Yes	1.000				1.000				1.000			
No	1.413	1.094	1.824	0.0080	1.053	0.887	1.249	0.5583	1.155	0.807	1.655	0.4302
Smoking status												
Yes	1.303	1.238	1.371	<.0001	1.339	1.287	1.393	<.0001	1.344	1.245	1.451	<.0001
No	1.000				1.000				1.236	1.146	1.334	
Alcohol status												
No	0.758	0.727	0.789	<.0001	0.962	0.922	1.004	0.0781	1.236	1.146	1.334	<.0001
Yes	1.000				1.000				1.000			
Occupation												
White color	0.740	0.572	0.957	0.0219	1.784	1.503	2.117	<.0001	0.778	0.543	1.116	0.1725
Blue color	0.949	0.734	1.226	0.6870	1.285	1.083	1.525	0.0041	0.806	0.564	1.153	0.2379
Etc.(Professional soldier, Housewife, Student etc)	1.000				1.000				1.000			
Married status												
Live with spouse	0.775	0.720	0.835	<.0001	1.100	1.049	1.154	<.0001	0.856	0.778	0.942	0.0015
Divorce	1.065	0.964	1.176	0.2149	1.185	1.096	1.281	<.0001	1.575	1.387	1.789	<.0001
Bereavement	0.975	0.892	1.066	0.5789	0.833	0.773	0.897	<.0001	1.328	1.167	1.510	<.0001
Separation	0.827	0.710	0.963	0.0147	1.265	1.122	1.426	0.0001	1.309	1.075	1.594	0.0073
Single	1.000				1.000				1.000			

* adjusted for socioeconomic factors and health status and risk factors

3.3 Social factors affecting the link between subjective sleep quality and subjective health conditions, subjective stress experience, and depression experience

We tabulated the social factors affecting the link between subjective sleep quality and subjective health condition, subjective stress experience, and depression experience (Table 3). Social factors were stratified based on sex (male and female) and age (over 60s, below).

We found a link between quality of sleep and subjective health condition for both men (OR: 5.036, 95% CI: 4.302−5.896, p-value: <.0001) and women (OR: 4.389, 95% CI: 3.905−4.933, p-value: <.0001) in terms of sex. In terms of age, quality of sleep was linked with subjective health condition both for those in the below 60s (OR: 4.295, 95% CI: 3.746−4.925, p-value: <.0001) and older age groups (OR: 4.737, 95% CI: 4.225−5.311, p-value: <.0001).

The results also showed a link between quality of sleep and subjective stress experience for both men (OR: 3.931, 95% CI: 3.414−4.525, p-value: <.0001) and women (OR: 3.555, 95% CI: 3.203−3.945, p-value: <.0001) in terms of sex. As for age, quality of sleep was linked with subjective health condition for those in the below 60s (OR: 3.697, 95% CI: 3.295−4.149, p-value: <.0001) and older age groups (OR: 3.756, 95% CI: 3.290−4.289, p-value: <.0001).

Finally, we also found a link between quality of sleep and depression experience for both men (OR: 2.297, 95% CI: 1.821-2.896, p-value: <.0001) and women (OR: 1.822, 95% CI: 1.562−2.127, p-value: <.0001) in terms of sex. A link between quality of sleep and subjective health condition was also seen for those in the below 60s (OR: 2.189, 95% CI: 1.844−2.599, p-value: <.0001) and older age groups (OR: 1.627, 95% CI: 1.339−1.976, p-value: <.0001).

Table 3. Adjusted effect between overall quality of sleep and health outcome by age and gender

Variables	Self-related health (Bad)							
	OR	95% CI		P-value	OR	95% CI		P-value
Sex	Male				Female			
Overall quality of sleep								
Very good	1.000				1.000			
Good	1.304	1.204	1.412	<.0001	1.393	1.290	1.506	<.0001
Bad	2.697	2.452	2.967	<.0001	2.911	2.673	3.170	<.0001
Very bad	5.036	4.302	5.896	<.0001	4.389	3.905	4.933	<.0001
Age	Under 60 years old				Over 60years old			
Overall quality of sleep								
Very good	1.000				1.000			
Good	1.253	1.152	1.362	<.0001	1.501	1.402	1.608	<.0001
Bad	2.510	2.283	2.759	<.0001	3.221	2.974	3.488	<.0001
Very bad	4.295	3.746	4.925	<.0001	4.737	4.225	5.311	<.0001
	Self-related Stress (Feel)							
	OR	95% CI		P-value	OR	95% CI		P-value
Sex	Male				Female			
Overall quality of sleep								
Very good	1.000				1.000			
Good	1.327	1.248	1.411	<.0001	1.308	1.227	1.394	<.0001
Bad	2.504	2.319	2.704	<.0001	2.495	2.322	2.680	<.0001
Very bad	3.931	3.414	4.525	<.0001	3.555	3.203	3.945	<.0001
Age	Under 60 years old				Over 60years old			
Overall quality of sleep								
Very good	1.000				1.000			
Good	1.318	1.254	1.384	<.0001	1.346	1.223	1.481	<.0001
Bad	2.572	2.422	2.731	<.0001	2.441	2.196	2.714	<.0001
Very bad	3.697	3.295	4.149	<.0001	3.756	3.290	4.289	<.0001
	Experienced Depression (Yes)							
	OR	95% CI		P-value	OR	95% CI		P-value
Sex	Male				Female			
Overall quality of sleep								
Very good	1.000				1.000			
Good	1.147	0.972	1.352	0.1049	0.997	0.884	1.123	0.9548
Bad	1.777	1.481	2.134	<.0001	1.254	1.101	1.429	0.0007
Very bad	2.297	1.821	2.896	<.0001	1.822	1.562	2.127	<.0001
Age	Under 60 years old				Over 60years old			
Overall quality of sleep								
Very good	1.000				1.000			
Good	1.111	0.982	1.257	0.0960	0.922	0.789	1.076	0.3028
Bad	1.544	1.348	1.768	<.0001	1.158	0.976	1.374	0.0919
Very bad	2.189	1.844	2.599	<.0001	1.627	1.339	1.976	<.0001

* Adjusted for socioeconomic factors and health status and risk factors

4. Discussion

Using Community Health Survey data conducted by the Korea Centers for Disease Control and Prevention, this study analyzed the link between quality of sleep and subjective health conditions, stress experiences, and depression experiences among adults in Korea.

The results of this study are as follows. First, subjective health conditions were worse in those who reported very poor quality of sleep. This is interpreted as consistent with reports that negative assessments of one's subjective health are also related to poor quality of sleep (Doi et al., 2003; Haseli-Mashhadi et al., 2009; Pilcher, Ginter, & Sadowsky, 1997). In addition, the decrease in sleep quality affects the overall quality of life (Buysse et al., 1989), bringing headaches, fatigue, decreased concentration, decreased activity, and other physical problems, including anxiety, depression, and stress (Adam et al., 2006; Nilsson et al., 2005). Therefore, it is thought that the decline in sleep quality also affects subjective perception of health by affecting the overall quality of life.

Second, those who reported very poor quality of sleep experienced more subjective stress compared with those who reported very good quality of sleep. This supports prior research that poor sleep quality causes daytime sleepiness and concentration disorders and has negative consequences for social activities (Kim et al., 2011). A lower quality of sleep is thus statistically linked with a high level of life stress (Sung & Chang, 2007) as high stress hinders sleep and sleep recovery (Akerstedt et al., 2002).

Third, in the analysis of whether people experience depression owing to their subjective quality of sleep, the respondents who had very poor sleep quality experienced depression more than those who reported having very good quality of sleep. This results correspond to previous results demonstrating that many people feel depressed when sleep is insufficient (Lallukka et al., 2018; Reite et al., 2001; Zack et al., 2004). This is thought that quality of sleep affects depression through studies that insomnia patients are 10 times more likely to develop depression than normal sleepers (Taylor et al., 2005), and those who complain of persistent insomnia are three times more likely to develop depression within a year (Ford & Kamerow, 1989). Therefore, it was found that the quality of sleep affects subjective health, stress, and depression.

In a Korean study of the general population, Cho et al. (2009) found that 22.8% of Koreans complain of sleeplessness (Cho et al., 2009). Also, reports have indicated a steady increase in the number of health care providers owing to "sleep disorders (G47)" over the three-year period starting in 2012, with the number of care patients reaching 414,000 (National Health Insurance, 2015). In other words, it can be seen that the number of people experiencing sleep disorders is increasing as becoming modern society. However, insufficient sleep or poor sleep quality can lead to physical problems, such as headaches, fatigue, decreased activity, and daytime sleepiness, or emotional difficulties, such as anxiety and depression as sleep is a process recovering the body and mind for the next day's normal activities (Buysse et al., 1998). Indicating that particularly insomnia due to sleep loss increases the risk of cardiovascular disease (Phillips & Mannino, 2007), it shows that it is a major factor for health. It is thus necessary to study quality of sleep as it can affect mental and physical health and also affect the decrease in quality of life, which is a

big social problem (Ishak et al., 2012).

First, as a result of examining factors influencing this to improve quality of sleep, it has been shown that sleep reactivity affects the sleep quality. Sleep reactivity is a term that refers to the degree to make sleep difficult to fall asleep or fall asleep, interfering sleep with stress exposures, and it means that people with high sleep reactivity have a greater risk of insomnia as they are more aware of stress (Baglioni et al., 2011; Drake, Pillai, & Roth, 2014). That is, people with a highly responsive sleep system experience rapid deterioration of sleep when stressed. Like this, stress directly affects sleep quality through sleep reactivity. Insomnia caused by such stress also affects the stress again. This is because people who do not have enough quality of sleep tend to be very stress as they have high levels of awakening and excitement before going to bed (LeBlanc et al., 2007; Morin et al., 2003; Harvey, 2000). The sleep quality and stress thus are correlated, and it indicates recognition of stress caused by deterioration of sleep quality is an important variable that negatively affects not only sleep quality but also subjective and psychological well-being (Hamilton et al., 2007).

Next, it was found that the quality of sleep also affects an experience of depression. In a previous study on the subjective evaluation of adults aged at least 20 years (Kaneita et al., 2006). Kaneita et al. (2006) indicated that adults are more likely to become depressed as the sufficiency of sleep decreases. Another previous study found that people with insomnia were twice as likely to develop depression as people without a sleep disorder (Baglioni et al., 2011). This suggests that insomnia is a dangerous factor for quality of sleep as quality of sleep affects not only stress but also depression. In particular, depression is the second largest disease burden in developed countries in 2020 according to the World Health Organization (WHO) (Murray, 1990), and has a significant impact on mortality (Gilman et al., 2017). It is thus necessary to carefully look at insomnia to prevent such social problems as insomnia affects depression.

Such as this, since quality of sleep poses a threat to stress, depression, and many physical health, there is a concern that it may also affect subjective health. According to a previous study analyzing subjective quality of sleep and subjective health, it was found that there is a high correlation between subjective quality of sleep and subjective health (Lemola, Ledermann, & Friedman, 2013). Namely, it means that if the subjective quality of sleep is low, the subjective health is also low. Furthermore, it is expected quality of sleep will have a significant impact on quality of life as quality of sleep restores and maintains cognitive functions such as mental fatigue and memory (Gangwisch et al., 2005). The quality of sleep can thus deteriorate subjective health (Magee et al., 2011), as the quality of sleep affects not only factors such as depression and stress, but also various factors. However, efforts to improve quality of sleep are important as subjective health is an important indicator of human health or quality of life including physical and mental health (Kessler et al., 2006; Ha & Park, 2012).

In the present United States, basic data, such as recommendations for appropriate sleep hours (Hirshkowitz et al., 2015) and guidelines for drug treatment of chronic insomnia (Sateia, 2017), are being published based on relevant studies to improve social problems about sleep disorders and there is a lot of interest. Meanwhile, in Korea, insomnia due to sleep disorders is on the rise, but basic data related to it are scarce compared to the United States. It is thought that this phenomenon

is occurring due to the lack of awareness of sleep disorders in Korea. Thus, a nationwide health education on awareness for proper sleep is essential, to help Koreans live physically and mentally healthy days. To suggest this, in implementing health education in Korea, it is thought that it is one way to focus on age based on a result that the elderly aged 60 years or older (34.6%) experienced a high rate of sleep disorders (Cho et al., 2009). Continually, according to a study on how to improve sleep disorders, it have shown that Mindfulness Based Stress Reduction program (MBSR) significantly improves sleep quality and reduces cognitive processes that interfere with sleep (Winbush, Gross, & Kreitzer, 2007). It is thus expected that MBSR will be effective, considering that sleep disorders affect mental health such as stress and depression. Finally, this study raises a need for developments of long-term intervention programs focused on improving mental health through improved quality of sleep and older age groups with a high rate of sleep disorders.

The present research has the following limitations. First, as this study was conducted as a cross-sectional analysis using data from the 2018 Community Health Survey, further follow-up studies are needed to confirm the link between subjective sleep quality and subjective health conditions, subjective stress, and depression. Second, subjective quality of sleep was not analyzed by dividing it according to sleep duration. Whether sleep is appropriate, insufficient, or excessive for each person depends on individual feeling. Thus, we excluded the association with the quality of sleep. It is also difficult to establish accurate standards for classifying appropriate sleep duration. Subsequent studies need to examine the quality of sleep through more suitable measuring tools. Third, we used the variables of quality of sleep, stress, and depression experience measure by self-examination, which may lead to poor objectivity or reliability. As no interviews with experts or trained evaluators were conducted, there may be regression bias. As such, attention to interpretation is required.

Nevertheless, this study has the advantage of having generalizable results because we used a large-scale sample that could represent local communities. It has also the advantage of being able to identify the direct effects of sleep quality by considering variables such as sleep duration, insomnia, and sleepiness during social activities.

5. Conclusions

Healthy sleep is an indispensable factor in maintaining and recovering good quality of life and mental health. However, insomnia is a disorder with a high prevalence rate, accounting for 35% of the Korean population. Indeed, 9% of Korean adults experience insomnia in their daily lives. Education programs for sleep duration are commonly implemented. However, programs for improving sleep quality and awareness remain lacking. Therefore, this study is expected to help in the development of programs aimed at improving the quality of sleep by revealing that inappropriate sleep can lead to physical and mental disabilities. Additionally, there is a need for the development of sleep programs that take into account gender and age considerations.

Conflicts of Interest

The authors declare no conflict of interest.

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