Sleep Medicine and Psychophysiology
수면 · 정신생리 28(1): 34-42, 2021

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https://doi.org/10.14401/KASMED.2021.28.1.34

전업주부의 양육 부담과 우울감이 수면의 질에 미치는 영향: 가계수입의 조절된 매개효과 검증

The Influence of the Burden of Nurturing and Depression on Sleep Quality in Female Full-Time Homemakers : The Moderated Mediating Effect of Monthly Income

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■ ABSTRACT

Objectives: This study investigated sleep quality in female full-time homemakers and evaluated the relationship of sleep disturbance with psychological and socio-environmental factors.

Methods: This cross-sectional study adopted a structured survey and sequential recruitment method for randomized participation of community-dwelling full-time female homemakers. Sleep quality and mental health were measured using the Korean version of the Pittsburgh Sleep Quality Index (K-PSQI), Korean version of the Beck Depression Inventory-II (K-BDI-II), Korean version of the Beck Anxiety Inventory (K-BAI), and Korean version of the Beck Hopelessness Scale (K-BHS). The willingness-to-pay (WTP) method was selected to measure the self-evaluated monetary value of household service work. The relationship among the main relevant factors was statistically analyzed through a mediation model.

Results: A total of 166 participants were analyzed and classified having poor versus good sleep quality (poor : 24.1%, n = 40 ; good : 75.9%, n = 126 ; cut-off point = 9 on the K-PSQI). Significant between-group differences were observed in mental health status (K-BDI-II, $p < 0.001$; K-BAI, $p < 0.001$; K-BHS, $p = 0.003$). The moderated mediation model was verified, indicating that depression may mediate the association between nurturing burden and sleep disturbance. The path from nurturing burden to depression may be moderated by average monthly household income.

Conclusion: A relatively high portion of full-time female homemakers may suffer from sleep disturbance and interactions between psychological and socio-environmental factors might determine sleep quality, suggesting the need for public health policies targeting improvement of sleep quality and mental health among full-time homemakers. **Sleep Medicine and Psychophysiology 2021 ; 28(1) : 34-42**

Key words: Cross-sectional · Female · Full-time homemaker · Mediation model · Mental health · Sleep quality.

Received: February 7, 2021 / **Revised:** June 14, 2021 / **Accepted:** June 14, 2021
This research was supported by the grant of Insan Research Fund for Psychiatry (2017).

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Introduction

Sleep quality is important in the perspective of the maintenance of mental health, considering that sleep disturbance is prevalent and included as one of the main symptoms in the diagnostic criteria of many psychiatric disorders (American Psychiatry Association 2013). In general, sleep disturbance may be one of the first signs of mental distress and may frequently accompany or be bi-directionally related to common mental health problems, i.e., depression, anxiety, and psychosis on sleep quality has been empirically established (Alvaro et al. 2013 ; Cerolini et al. 2016 ; Gillin 1998 ; Papadimitriou and Linkowski 2005). Especially, sleep complaints are the most frequent clinical manifestation in patients with depression and sleep disturbance such as insomnia or hypersomnia has been considered one of the main symptoms of depression (Tsuno and Besset 2005). Also, insomnia may be epidemiologically a prospective risk factor for depression (Ford and Kamerow 1989 ; Gillin 1998 ; Morphy et al. 2007), and depression is associated with altered sleep architecture, i.e., decrease in slow-wave sleep (SWS) production and disturbed rapid eye movement (REM) sleep regulation (Palagini et al. 2013). Accordingly, each phenomenon of depression and sleep abnormality has been found entangled, implicating close clinical relationships, and shared complex neural substrates.

Meanwhile, a large body of research indicated several risk factors of sleep disturbance : female gender, advanced age, and stressful life events (American Psychiatry Association 2013). In particular, previous researches manifested that the prevalence of sleep disturbance is consistently high in women, suggesting increased vulnerability to poor sleep quality due to the impact of biological and socio-environmental factors ; frequent hormonal changes due to pregnancy or menopause which are experienced in midlife of a woman aged from 30 to 50 years (Blümel et al. 2012 ; Weyerer and Dilling 1991), and lack of time to rest and spare in daily life, stressful life events and labor for caring of family members (Arber et al. 2009 ; Basner et al. 2007 ; Chen and Kawachi 2005). Accordingly, it may be assumed that the full-time female homemakers are at high risk for sleep disturbance and poor mental health.

It has been also increasingly reported in previous studies that sleep quality is associated with demographic and socioeconomic factors. A substantial portion of sleep complaints by women in unemployment status might be explained by other sociodemographic factors including marital status, education level, and monthly income (Grandner et al. 2010). Individuals in the lower socioeconomic status (SES) generally tend to show less sleep duration and/or lower sleep quality (Gellis et al. 2005), which is compatible with the result that more complaints of insomnia in the lower SES group were significantly manifested as compared to the higher SES group (Ford and Kamerow 1989 ; Karacan et al. 1976). Overall, these findings may indicate that plausible role of the demographic and socioeconomic factors should be considered in analyzing the relationship between mental health and sleep quality.

According to the Report on the time use survey (2019) and the Household Production Satellite Account (2019) published by National Statistical Office, full-time female homemakers spent an average of 5 hours and 41 minutes a day for household service work, contributing 47.2% of total unpaid household service work which is equivalent to 24.3% of nominal Gross Domestic Product (GDP) (Korea Statistical Information Service 2019). Thus, full-time female homemakers play a pivotal role in the maintenance of our society, taking charge of nurturing of children, care of family members, and management of problems within a family, etc. Nevertheless, societal recognition of full-time homemakers' labor value and social treatment of full-time homemakers have not yet been properly established in our society (Chang and Woo 2017 ; Moon 1994). Full-time female homemakers are likely to be exposed to persistent stress due to overburden of domestic labor and repetitive daily routines, leading to be vulnerable to mental health problems and poor quality of sleep.

The first purpose of this study, in the perspective of public health, was to investigate the level of sleep quality and mental health status in the community-dwelling full-time female homemakers as a target group for community mental health services. In the perspective of integration of sleep quality-related factors in full-time female homemakers, a moderated mediation model was proposed, whereby as a secondary purpose, this study aimed at verifying the simpli-

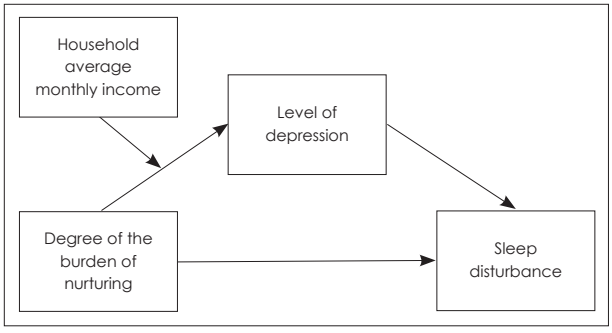

Figure 1. Basic hypothesis in this study. The hypothesis is simplified as follows : monthly income may moderate the association between the burdens of nurturing and depression and then depression may mediate the association between the burdens of nurturing and sleep disturbance.

fied hypothesis that depression would mediate the association between the burdens of nurturing and sleep disturbance and then the path from the burdens of nurturing to depression would be moderated by monthly income (Figure 1).

Methods

1. Study design and overview

This research was a cross-sectional public health study using a structured survey method and sequential recruitment method for randomized participation of subjects and was conducted through surveyors who had received collective education and training in advance. This study was approved by the local Institutional Review Board (IRB No. 3-124474-A-N-01) and informed consent was obtained before participation from individual participants.

2. Participants

A total of 180 participants aged 19 to 50 were recruited on community-dwelling women working as full-time homemakers in a large city with a population of more than 600,000 people. Participants were living in Jeonbuk Province and recruited through an announcement in the online website for female homemakers. The survey was conducted in an annual event hold by the online community for homemakers. A full-time homemaker was defined as follows : 1) a person who has been in charge of household service works for at least one year before participating in the research, and 2) who has not engaged in other occupational activity. The exclusion criteria were as follows : 1) a person who has been hospitalized for mental illness other than depression, 2) a person who has an excessive drinking problem or has been diagnosed with alcohol use disorder, 3) a person with a severe internal or neurological problem that requires inpatient treatment.

The sample size was determined to be 180 using G*Power Analysis software program (Erdfelder et al. 1996), for which effect size of 0.15 for the regression analysis, two-tailed significance level (α) of 0.05, power (1-β) of 0.95, and drop-out rate of 10% were applied due to the absence of prior research.

3. Composition of structured questionnaire

Structured self-reporting questionnaire was composed of general sociodemographic items, items related to willingness-to-pay method for monetary valuation of household service work, and standardized scales for the assessment of mental health.

Sociodemographic items include age, educational level, average household monthly income, smoking status, alcohol consumption status, number of children in the family, level of social activity, and level of physical exercise, and were assessed with 5-point Likert scale. The degree of bond with the husband and the degree of burden of nurturing were also included and measured using a visual analogue scale (VAS, range : 0 to 10).

4. Willingness-to-pay method

In this study, self-willingness-to-pay (Self-WTP) was adopted for self-evaluation of maximum monetary value of household service work of individual full-time female homemaker and was presented as an auxiliary indicator of the mental health status and the level of self-esteem of a full-time female homemaker.

Willingness-to-pay (WTP) method was originally introduced for the cost-benefit analysis (CBA) in the field of pharmacoeconomics through monetary valuation of health benefits of new healthcare intervention (Bala et al. 1999). To date, WTP method has been expanded to various areas, such as decision-making on medical practice due to the burden of disease or public health policy decisions based on a monetary assessment of the quality-adjusted life-year (QALY) (Augustin et al. 2018 ; Bobinac et al. 2010). In the area of mental health, WTP method is also used to determine preferences related to mental health and to develop mental health policy (Daltio and Attux 2017).

5. Instruments for the assessment of mental health

1) Korean version of Pittsburgh Sleep Quality Index (K-PSQI) (Buysse et al. 1989 ; Sohn et al. 2012)

This validated scale is an 18-item questionnaire and is used to measure habitual sleep quality over the past month. It is comprised of 7 subscales assessing habitual duration of sleep, nocturnal sleep disturbances, sleep latency, sleep quality, daytime dysfunction, sleep medication usage, and sleep efficiency. Each subscale has a possible score of between 0−3, with an overall global score of 0−21, with higher scores reflecting poorer sleep quality. Based on the Korean version of PSQI, the present study used the established cutoff of a score of ≥ 9 as poor sleep quality.

2) The Korean version of Glasgow Sleep Effort Scale (K-GSES) (Broomfield and Espie 2005 ; Kim et al. 2014)

This validated measure is composed of 7 self-report items on a Likert scale, assessing the extent to which individuals engage in effortful attempts to sleep. Higher scores indicate greater sleep effort.

3) Korean version of Beck Depression Inventory-II (K-BDI-II) (Beck et al. 1996 ; Lim et al. 2011)

This 21-item self-report validated scale was conducted to measure depressed mood. Each item is rated from 0 to 3, possible total score range of 0 to 63, with higher score indicating severe depressive symptoms. According to the summed score, severity is divided into four levels ; score range of 0 to 13, normal ; score range of 14 to 19, mild ; score range of 20 to 28, moderate ; score range of 29 to 63, severe.

4) Korean version of Beck Anxiety Inventory (K-BAI) (Beck and Steer 1990 ; Yook and Kim 1997)

This validated scale is the most widely used measure of anxiety severity in different clinical populations. This 21-item self-report questionnaire is comprised of 3 subscales assessing cognitive, emotional, and somatic domain. Each subscale has a possible score range of 0 to 3 with a total score of 0−63, and higher total score indicates severe level of anxiety. Severity is divided into four levels ; 0 to 7, normal ; 8 to 15 ; mild, 16 to 25 ; moderate, 26 or higher ; severe.

5) Korean version of Beck Hopelessness Scale (K-BHS) (Beck et al. 1988 ; Kim et al. 2015)

This scale includes 20 true-false items that assess a general tendency toward pessimism and negative expectancies. Severity is divided into four levels ; score range of 0 to 3, normal ; score range of 4 to 8, mild ; score range of 9 to 14, moderate ; score range of 15 or higher, severe.

6) Korean version of Rosenberg Self-Esteem Scale (RSES) (Goldsmith 1986 ; Bae et al. 2014)

This 10-item Likert scale questionnaire is a widely used self-report instrument developed and validated for evaluating individual global self-esteem. The sum of these scores may range from 10 to 40 ; higher scores indicate higher self-esteem.

6. Data analysis

Frequency analysis, descriptive statistical analysis, and independent samples t-test were conducted to identify demographic characteristics of participants in this study and to select variables that significantly reveal differences between good and poor sleep quality groups. And then, to examine the overall tendency of the variables and check whether the variables meet the assumption of normal distribution, skewness and kurtosis were analyzed. For those variables that did not meet the criteria, stabilization process was carried out using methods such as eliminating extreme values (i.e., higher than 2SD) and correction of missing values.

As a step to verify the hypothesis presented in Figure 1, to determine whether the effect of the burden of nurturing in full-time female homemakers on the sleep disturbance was mediated by depression, first, the four-step procedure was followed for regression analysis (Baron and Kenny 1986). The significance of the effect was verified by using the bootstrap technique to calculate the 95% confidence interval for indirect effect, and then to determine whether 0 was included within the interval. At last, the moderated mediation effect was verified using the PROCESS Macro Model 7. The bootstrapping method to test the significance of the effects was used to obtain robust standard errors for parameter estimation (Hayes 2017).

SPSS 18.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analyses. All tests were considered statistically significant if the two-sided p value is < 0.05.

Results

1. Sociodemographic characteristics of all participants

Of a total of 180 participants, 166 were eligible for enrollment and analysis. The mean (SD) age and duration of education was 33.81 (4.30) years and 15.20 (2.05) years, respectively. The average household monthly income was 323.79 (213.87) (unit : 10^4 KRW) with relatively broad range. In the mean of Self-WTP as maximum monthly monetary compensation, 238.16 (unit : 10^4 KRW), which was nearly 1.8 times minimum monthly wage for 2017. Also, in the degree of burden of nurturing, 6.29 (2.36) in the VAS score manifested relatively negative result. The other sociodemographic characteristics and the general mental health status of all participants are shown in Table 1.

2. Comparisons between good and poor sleep quality groups

To identify variables that may significantly affect the sleep disturbance or sleep quality, a total of 166 participants were divided into two groups of good and poor sleep quality based on the total score on K-PSQI (Sleep quality cut-off point on K-PSQI : ≤ 8 for good ; ≥ 9 for poor). As a result, 24.1% of those analyzed were found to belong to poor sleep quality group. Table 1 shows the results of between-group comparative analyses on sociodemographic items and each mental health status, in which independent student t-test was conducted to examine the significant difference. Significant differences were manifested on each scale reflecting mental health status (K-PSQI, $p < 0.001$; K-GSES, $p < 0.001$; K-BDI-II, $p < 0.001$; K-BAI, $p < 0.001$; K-BHS, $p = 0.001$). Significant differences were also shown in the level of social activi-

Table 1. Comparisons between good and poor sleep quality group in sociodemographic characteristics and mental health indicators

	Total (n = 166)	Good sleep quality group (n = 126)	Poor sleep quality group (n = 40)	t
Age	33.81 (4.30)	33.79 (4.42)	33.85 (3.93)	0.07
Duration of education	15.20 (2.05)	15.02 (1.96)	15.80 (2.24)	-2.13*
Household average monthly income	323.79 (213.87)	301.49 (119.66)	389.56 (367.78)	-2.25*
Number of children in the family	1.60 (0.78)	1.62 (0.80)	1.55 (0.71)	0.49
Level of exercise	1.82 (1.01)	1.89 (1.04)	1.60 (0.87)	0.84
Self-WTP	238.16 (90.55)	234.76 (81.33)	248.88 (115.49)	-0.86
Level of social activity	3.18 (1.19)	3.30 (1.17)	2.80 (1.20)	2.35*
Degree of bond with husband	6.74 (2.15)	6.82 (2.15)	6.49 (2.17)	0.84
Degree of burden of nurturing	6.29 (2.36)	5.92 (2.29)	7.45 (2.22)	-3.71†
K-PSQI	6.83 (3.39)	5.27 (1.83)	11.73 (2.35)	-18.80†
K-GSES	3.69 (2.79)	2.96 (2.10)	5.98 (3.42)	-20.69†
K-BDI-II	13.72 (0.65)	12.10 (7.88)	18.80 (8.08)	-19.78†
K-BAI	7.14 (0.57)	5.83 (6.13)	11.28 (9.19)	-4.30†
K-BHS	5.33 (0.31)	4.71 (3.49)	7.30 (4.84)	-3.71†
RSES	35.50 (5.53)	35.87 (5.68)	34.33 (4.90)	1.55

∗ : Indicates $p < 0.05$, † : Indicates $p < 0.01$. K-BAI : Korean version of Beck Anxiety Inventory, K-BDI-II : Korean versions of Beck Depression Inventory-II, K-BHS : Korean version of Beck Hopelessness Scale, K-GSES : Korean version of Glasgow Sleep Effort Scale, K-PSQI : Korean version of Pittsburg Sleep Quality Index, RSES : Rosenberg Self-Esteem Scale, Self-WTP : Self-Willingness-to-pay (maximum monetary valuation of household service work of individual full-time homemaker)

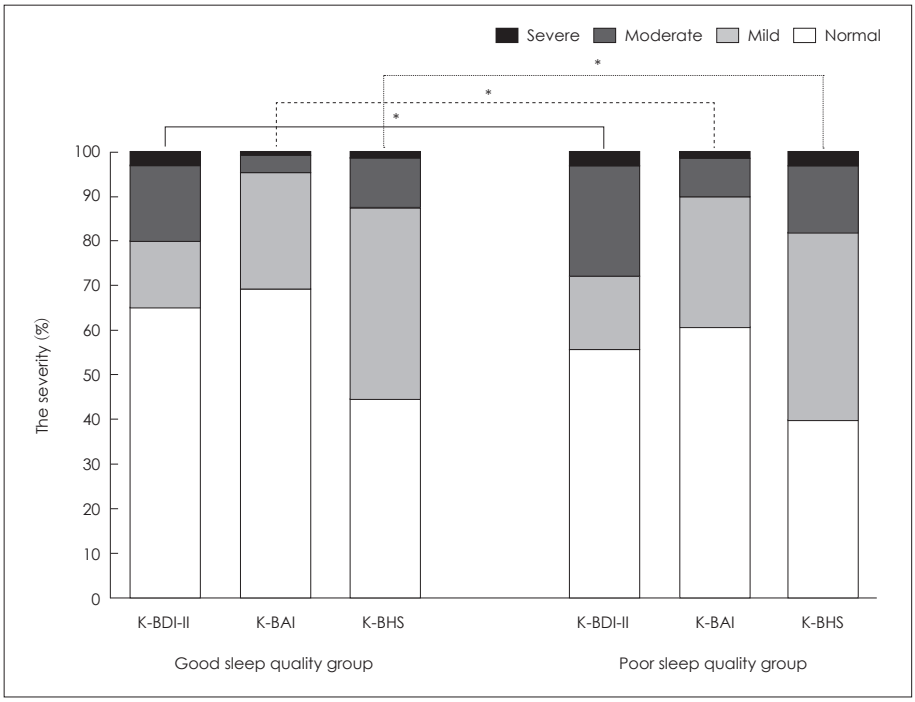

Figure 2. Between-group differences in the distribution of the severity on each scale of depression (K-BDI-II), anxiety (K-BAI), and hopelessness (K-BHS). The histograms in the figure show that as well as the normal level, all the severity levels on each scale were appearing in each group. The proportion of all severity levels was higher in poor sleep quality group than in good sleep quality group. The significant differences were manifested on K-BDI-II scale for depression level and on K-BAI scale for anxiety level. ∗ : Indicates $p < 0.01$. K-BAI : Korean version of Beck Anxiety Inventory, K-BHS : Korean version of Beck Hopelessness Scale, K-BDI-II : Korean versions of Beck Depression Inventory-II.

ty (t = 2.35, $p = 0.020$), duration of education (t = -2.13, $p = 0.035$), household average monthly income (t = -2.25, $p = 0.026$), and degree of burden of nurturing (t = -3.71, $p < 0.001$). However, there were no significant differences in age, number of children in the family, level of exercise, degree of bond with husband, Self-WTP, and RSES ($p > 0.05$). Also, the differences between the two groups in the distribution of the severity of mental health status are shown in Figure 2.

3. Association between main variables

1) Mediation models

Prior to the mediation analysis, skewness, kurtosis, and Pearson bivariate correlations among variables were analyzed

Table 2. Skewness, kurtosis, and correlations between main variables

	Skewness	Kurtosis	1	2	3	4	5	6	7	8
1. K-PSQI	0.87	0.41	1	0.43†	0.47†	0.29†	0.17*	0.12	-0.12*	0.31†
2. K-BDI-II	0.52	-0.13	0.43†	1	0.60†	0.52†	-0.12	-0.22**	-0.31†	0.32†
3. K-BAI	2.05	7.12	0.47†	0.60**	1	0.48†	0.04	-0.19*	-0.12	0.19*
4. K-BHS	1.20	1.00	0.29†	0.52**	0.48†	1	-0.09	-0.10	-0.36†	0.19*
5. Duration of education	0.50	0.50	0.17*	-0.12	0.05	-0.09	1	-0.00	0.14	-0.01
6. Household average monthly income	4.46	29.99	0.12	-0.22†	-0.19*	-0.10	-0.00	1	0.12	0.07
7. Level of Social activity	-0.22	-0.67	-0.17*	-0.31†	-0.12	-0.36†	0.14	0.12	1	-0.12
8. Degree of burden of nurturing	-0.33	0.05	0.31†	0.32†	0.19*	0.19*	-0.01	0.07	-0.12	1

∗ : Indicates $p < 0.05$, † : Indicates $p < 0.01$. K-BAI : Korean version of Beck Anxiety Inventory, K-BDI-II : Korean versions of Beck Depression Inventory-II, K-BHS : Korean version of Beck Hopelessness Scale, K-PSQI : Korean version of Pittsburg Sleep Quality Index

Table 3. Verification of the mediation effect of depression on sleep disturbance

Model	IV	DV	Non-standardized coefficient		Standardized coefficient	t	R^2
			B	S.E.	β		
Stage 1 (IV→MV)	Burden of nurturing	Depression	1.228	0.262	0.346	4.694*	0.120
Stage 2 (IV→DV)	Burden of nurturing	Sleep disturbance	0.094	0.020	0.348	4.731*	0.121
Stage 3 (IV, MV→DV)	Burden of nurturing	Sleep disturbance	0.064	0.020	0.237	3.180*	0.213
	Depression		0.025	0.006	0.322	4.321*	

∗ : Indicates $p < 0.01$. DV : dependent variable, IV : independent variable, MV : moderation variable

to examine the assumption of normal distribution and an overall tendency of the data (Table 2). Based on the criteria of normal distribution by Curran et al., (Curran et al. 1996) the scores on the K-BAI and household average monthly income showed excessively high value of skewness and kurtosis (i.e., higher than 2 and 7, respectively). These variables were considered not to meet the assumption of normality, and the extreme values (i.e., higher than 2SD) were eliminated and Expectation Maximization (EM) algorithm was conducted to manage missing data, accordingly. As a result, total 164 participants were included for the final analysis (127 in good sleep quality group ; 37 in poor sleep quality group).

To determine whether the effects of the burden of nurturing in full-time female homemakers on the sleep disturbance were mediated by depression, the four-step procedure to set up mediation effect was followed (Baron and Kenny 1986). The first step (model 1) showed that the burden of nurturing significantly predicted poor quality of sleep (i.e., higher total score on the K-PSQI), and the second step (model 2) suggested that degree of burden of nurturing significantly predicted increased depression. In the next step to examine the effect of moderate variable on dependent variable with the effect of the independent variable controlled (model 3), both the burden of nurturing and the score on K-BDI-II for depression significantly manifested positive prediction on poor sleep quality. The multiple effect size estimates are shown in Table 3. At last, the bootstrap method showed that the indirect effect from the burden of nurturing to poor sleep quality via depression was also significant [point estimate = 0.0006 ; S.E. = 0.0004 ; 95% CIs (-0.0015, -0.0001)], indicating that depression mediates the negative association between the burden of nurturing and sleep disturbance.

2) Moderated mediation

Subsequently, moderated mediation was tested using a bootstrapping procedure following model 7, in which moderation of the path between the independent variable and mediator was evaluated (Hayes 2017). Whether or not the association between the burden of nurturing and depression is moderated by household average monthly income within the mediational path models was examined. The result showed that household average monthly income moderates the indirect effect of the burden of nurturing on sleep disturbance through depression [point estimate = -0.0006, S.E. = 0.0004, 95% CIs (-0.0015, -0.0001)], indicating that depression has a higher indirect effect when household average monthly income is low than when it is high. Furthermore, the conditional indirect effect of the burden of nurturing on sleep disturbance via depression at the three levels of household average monthly income was investigated : low level below 1-SD of the mean, intermediate level around the mean, and high level above 1-SD of the mean. The results in Figure 3 shows that the conditional indirect effect was significant at the low [point estimate = 0.2866, S.E. = 0.0841, 95% CIs (0.14, 0.47)], the intermediate [point estimate = 0.2250, S.E. =

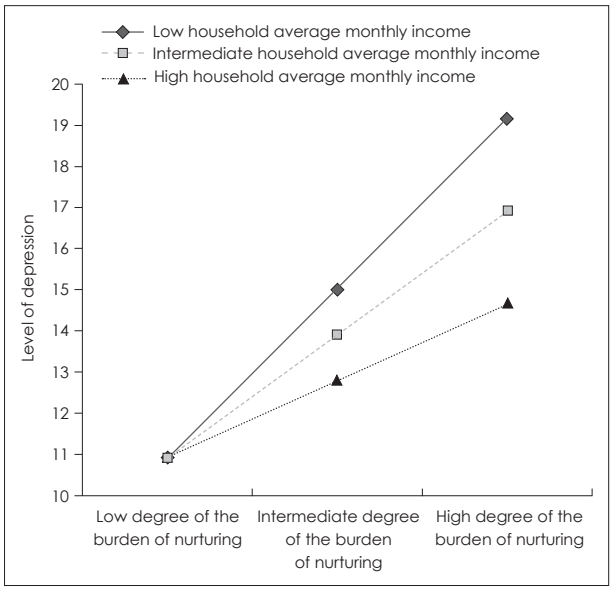

Figure 3. The association between the burden of nurturing and depression by the level of household average monthly income. The positive association of the burden of nurturing and depression was stronger among lower level of household average monthly income than among higher level. Low, intermediate and high household average monthly income indicates 2 million, 3 million, 4 million in KRW, respectively.

0.0629, 95% CIs (0.11, 0.36)], and the high level [point estimate = 0.1635, S.E. = 0.0594, 95% CIs (-0.05, 0.28)] of household average monthly income. These findings manifested statistically significant moderated mediation effects, implicating that within the mediation model, the positive association of the burden of nurturing and depression was stronger in the lower level of household average monthly income than in the higher level of household average monthly income.

Discussion

The present study investigated the status of sleep quality as a representative indicator of the well-being of life and the mental health in community-dwelling full-time female homemakers, and aimed at verifying, through the mediation model, the relationship between the main relevant factors that affect sleep quality.

The findings of this cross-sectional study showed that 24.1% of participants were in a state of poor sleep quality over the past month, suggesting that sleep disturbance may be relatively prevalent in full-time female homemakers. Also, it is noteworthy that although the total score on K-PSQI higher than 8 points was regarded as poor sleep quality in this study as proposed in the previous study conducted by Sohn and colleagues (Sohn et al. 2012), more than 70% of the total sample (n = 121) would have been classified as poor sleep quality group with the cut-off score, i.e., higher than 5 points, of original version of PSQI used (Buysse et al. 1989). Thus, considering that this study targeted a specific group of relatively young women in a stressful situation, it would be implicated that full-time female homemakers are a group vulnerable to sleep disturbance and mental health problems.

Meanwhile, according to the results of the survey on mental health indicators, i.e., depression, anxiety, and hopelessness, the rates of participants with complaints of mental health problems were generally high, showing about 45% on depression (K-BDI-II ≥ 14), near 40% on anxiety (K-BAI ≥ 8), and about 60% on hopelessness (K-BHS ≥ 4), respectively. Furthermore, the comparative analyses between the poor and the good sleep quality groups manifested significant differences in the distribution of the scores on each scale, indicating close clinical relationships between mental health problem and sleep problem in full-time female homemakers. In particular, the difference between the two groups was more pronounced on the scale of depression, implicating the closer relationship of depression among the mental health indicators with the sleep quality, which is consistent with the findings in the previous studies reporting the strong interaction between sleep disturbance and depression (Al-Abri 2015 ; Ford and Kamerow 1989 ; Gillin 1998 ; Kahn et al. 2013 ; Tsuno et al. 2005). Accordingly, in the perspective of the role of a psychological factor, the impact of depression as the main mental health indicator on sleep quality was further verified in the mediation model.

On the other hand, no significant between-group differences were manifested on Self-WTP and RSES as a direct or indirect indicator of self-esteem, which suggest on a cross-sectional basis that the professional identity as a full-time homemaker may remain stable and the perceived role of a full-time homemaker itself may not be a factor negatively affecting the quality of sleep. It would be necessary, however, to further study the impact of prolonged exposure to the role as a full-time homemaker in stressful situations on self-esteem.

Besides the impact of mental health indicators as a psychological factor, between-group analyses showed the significant relationship of poor sleep quality with several sociodemographic and environmental factors, such as duration of education, household average monthly income, level of social activity and the burden of nurturing. Unlike in the general population (Patel et al. 2010), however, high household average monthly income and long duration of education in full-time female homemakers were found to be inversely related to sleep quality. These results in this study seem sufficiently plausible, in that for women with high level of income and educational background, working as a full-time homemaker could be a psychological distress because of high op-

portunity costs (Raymo et al. 2015). It is suggested, also, that among these factors, the burden of nurturing may be more closely related to poor sleep quality, as generally accepted and reported as a main psychological distress in women (Bird 1997). According, the burden of nurturing as a basic activity and the household average monthly income as an important environmental factor were further verified in the mediation model.

According to the results of the verification of the mediation model which was composed of the burden of nurturing, household average monthly income, depression, and sleep quality as presented in Figure 1, it was significantly manifested that depression would mediate the association between the burden of nurturing and sleep disturbance in full-time female homemakers, supporting the hypothetical explanation that the increased burden of nurturing may positively affect the level of depression and then the elevated level of depression may exacerbate the quality of sleep in full-time female homemakers. In this process, also, the moderating effect of household average monthly income has been proven significant, indicating that the aggravation of depression would be more pronounced in the lower level of household average monthly income. Overall, each psychological and socio-environmental factor, and the interaction between both factors through the moderating and mediating process might play an important role in the determination of sleep quality of individual full-time female homemaker.

The results of these above-mentioned verifications have several health policy implications relating to public health intervention to improve the quality of sleep in full-time female homemakers ; reduction of the burden of nurturing , increase in household income or adequate national compensation for unpaid household service work, early detection of depression, and direct treatment support for sleep problem in full-time female homemakers, for which a comprehensive and integrated approach in the field of community mental health services may be necessary with the legal and institutional readjustment and enforcement (Swiebel 1999).

This study has several limitations. First, it is necessary to consider that the score on VAS for the degree of the burden of nurturing without standardized objective assessment was used in this study. The burden of nurturing is a result of various and complex factors (e.g., caregiver's attitude towards parenting, characteristic and temperament of the child, existence of assistant caregivers), therefore future studies should consider using validated measures such as Parental Stress Scale (Berry and Jones 1995) to control and manage such factors. Also, other factors such as duration of the sleep and socio-environmental stress factors could be a confounding variable affecting sleep disturbance among homemakers, therefore should be included in the future study. Second, there may be some selection bias of the sample, because women aged 19 to 50 living in urban settings and using specific online websites were recruited in this study. The representativeness of samples in this study would be acceptable, however, considering that women account for about 75% of unpaid household service works ; women in their 30s are the most common at near 30% and women under the age of 50 account for about 60% of unpaid household service works ; the proportion of urban population is more than 90% (Korea Statistical Information Service 2019). Third, the cross-sectional study design and statistical verification method through the mediation model in this study may have relatively limited aspects to the solid establishment of the causal relationship between variables, although it is possible to evaluate the health status of a specific group quickly and efficiently. Thus, further study with the prospective design based on the cohort of full-time female homemakers may be necessary to replicate and extend the findings in this study. Finally, in this study, the assessment of sleep quality was performed using the validated and standardized scale (K-PSQI) based on subjective recollection instead of objective evaluation using a polysomnography. Although subjective sleep quality may have a mediating effect on negative emotional response (Grove et al. 2020), however, experience sampling methodology (ESM) or ecological momentary assessment (EMA) could be alternatively recommended for more objective and real-time data collection in the future study (Trull and Ebner-Priemer 2009).

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