

# Association Between Recent Experience of Childbirth and Sleep Quality in South Korean Women: Results from a Nationwide Study

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Woorim Kim<sup>1,\*</sup>  
Yeong Jun Ju<sup>2,3,\*</sup>  
Soon Young Lee<sup>3</sup>

<sup>1</sup>Division of Cancer Control & Policy, National Cancer Control Institute, National Cancer Center, Goyang-si, Gyeonggi-do, Republic of Korea;

<sup>2</sup>Institute of Health Services Research, Yonsei University College of Medicine, Seoul, Republic of Korea; <sup>3</sup>Department of Preventive Medicine and Public Health, Ajou University School of Medicine, Suwon-si, Gyeonggi-do, Republic of Korea

\*These authors contributed equally to this work

**Introduction:** Although women commonly report deterioration of sleep quality postpartum, this relationship has been less studied in East Asian countries. This study investigated the association between recent experience of childbirth and sleep quality in South Korean women and additionally examined how healthy practice behavior interplays in the stated relationship.

**Methods:** Data from the 2018 Community Health Survey were used. Sleep quality was measured using the Pittsburgh sleep quality index (PSQI). Women who responded to have given birth in the past year were categorized as having a recent experience of childbirth. The general characteristics of the study population were investigated using chi-square test. The association between the dependent and independent variables was analyzed using multi-variate logistic regression analysis.

**Results:** Of a total of 41,708 study participants, 16,877 (40.5%) individuals reported poor sleep quality. Poor sleep quality was more common in women with a recent experience of childbirth (48.4%) than those without (40.0%). Compared to individuals without a recent experience of childbirth, those with such an experience were more likely to show poor sleep quality (OR 1.50, 95% CI 1.34–1.68). Such differences were reduced in individuals with a healthy lifestyle.

**Conclusion:** Recent experience of childbirth was associated with higher likelihoods of poor sleep quality in women. The degree of risks found was reduced in individuals practicing a healthy lifestyle habit. The findings infer the need to monitor and address sleep-related disturbances commonly reported among postpartum women.

**Keywords:** sleep quality, sleep disturbances, postpartum, childbirth experience, healthy practice behavior

## Introduction

Quality of sleep can be defined as the physiologic characteristics that produce a feeling of restoration.<sup>1</sup> Sleep is known to have noticeable recuperative effects and has been reported as an essential function for memory consolidation.<sup>2</sup> Better sleep is also known to improve cognitive performance, with poor sleep quality being related to subjective cognitive decline or subjective cognitive decline-related functional difficulties.<sup>3</sup> Despite the importance of sleep quality on well-being and psychological functioning in humans, sleep quality is difficult to define or measure objectively due to its complex and subjective nature.<sup>4</sup> In fact, psychological factors such as depression and anxiety are known to affect subjective feelings about sleep

Correspondence: Soon Young Lee  
Department of Preventive Medicine and Public Health, Ajou University School of Medicine 206 World Cup-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16499, Republic of Korea  
Tel +82-31-219-5301  
Fax +82-31-219-5084  
Email solee@ajmc.ac.kr

quality. Under such circumstances, the Pittsburgh sleep quality index (PSQI) is one scale commonly utilized to measure sleep quality in a more reliable and standardized manner.<sup>5</sup> Specifically, the PSQI evaluates diverse aspects of sleep quality, including symptoms of insomnia and depression, over the course of one month.<sup>6</sup>

Identifying factors associated with sleep quality is particularly needed in the Asian population because profound reductions in sleep have been reported from these countries in the modern era.<sup>7</sup> Experiences of giving childbirth have been identified as a noticeable risk factor, with many women commonly reporting increased experiences of sleep disturbances postpartum.<sup>8</sup> The higher prevalence of poor sleep quality in postpartum women requires attention because fragmented, poor quality sleep is not only known to lead to increased neurobehavioral performance deficits, but also because the postpartum period is a markedly stressful and sensitive period for mothers in general.<sup>9,10</sup> Furthermore, symptoms of insomnia and poor sleep quality are known to persist for a significant time period in many women after giving childbirth, with around 60% of mothers reporting recovery from insomnia symptoms at eight weeks postpartum and around 40% of mothers at two years postpartum.<sup>11</sup>

Apart from experiences of childbirth, previous studies have also reported a relationship between lifestyle habits, such as alcohol, smoking, exercise, and diet, and sleep quality. In fact, a correlation between excessive alcohol consumption and poor subjective sleep quality, reduced sleep duration, and increased sleep disturbances have been previously reported.<sup>12</sup> Likewise, cigarette smokers are known to show poorer sleep quality than the general population.<sup>13</sup> Last, in a study assessing the effect of a walking intervention on subjective sleep quality, a walking intervention significantly improved perceived sleep quality in both exercising and non-exercising participant groups.<sup>14</sup> Despite reported associations between lifestyle habit and sleep, in addition to the fact that such factors are largely modifiable, no previous study has examined its potential effect on sleep quality in postpartum women. Therefore, the aim of this study was to investigate the association between recent experiences of childbirth and sleep quality in South Korean women and to additionally examine how lifestyle factors interplay in the stated relationship.

## Methods

### Study Population and Data

This study used data from the 2018 Korea Community Health Survey (KCHS), which is a study conducted annually

by the Korea Centers for Disease Control and Prevention. The KCHS is the only community-based cross-sectional study that exists in Korea, in which the survey is conducted annually at 253 administrative sites. Information is collected through in-person (one-on-one) interviews using the computer-assisted personal interview (CAPI) method. The study population is drawn from multistage, stratified area probability samples of civilian, non-institutionalized households classified based on geographic region, age, and sex. As the final study population sample is extracted based on national survey data, samples are considered as a representative of the Korean population.<sup>15</sup>

The 2018 KCHS data consisted of a total of 228,340 study participants. Women aged between 19 and 55 years were included as the study population as recent experience of childbirth was inquired only to this specific group in the KCHS. Hence, 165,614 individuals not subject to inquiry on recent childbirth experience (males, ages 56 years or above, etc.) were excluded. A total of 21,018 individuals with missing values on the studied variables were also excluded, resulting in the final study population consisting of 41,708 individuals.

## Measures

### Outcome Variable

The outcome measure of this study was sleep quality, measured using the Korean version of the Pittsburgh sleep quality index (PSQI) questionnaire. The PSQI is a 19-item self-reported questionnaire that measures the quality and pattern of sleep over a one-month period. Specifically, the PSQI consists of 19 items that add up to 7 components, which are subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Each component is scored into a scale between 0 and 3 and by adding the 7 components together, a general score measuring overall sleep quality can be obtained. The general score ranges between 0 and 21 scores of 6 or above commonly indicates poor sleep, as adopted in this study. The Korean version of the PSQI has been previously validated with high sensitivity and specificity.<sup>16,17</sup> Furthermore, a cutoff point of 5 has also been validated in the Korean population.<sup>18</sup>

### Recent Experience of Childbirth

The interesting variable of this study was “recent experience of childbirth.” Participants were inquired the following question: “Do you have experience giving birth (including normal and preterm birth) in the past year?” The available

answers were a 'yes' or a "no." Based on this question, women with experience of childbirth in the past one year were categorized into the 'yes' category. Previous studies investigating the psychological effect of childbirth have targeted individuals who had delivered in the past one year.<sup>19</sup> The one-year standard was also applied in research investigating depression and stress after childbirth in parents.<sup>20</sup>

In Korea, a paid maternity leave of 90 days (including at least 45 days postpartum) to women and a parental leave of one year to women and men is legally guaranteed. A total of 80% of average income for the first three months of parental leave and 50% of average income for the remaining nine months are paid. Hence, women with experience of giving birth may have been in their maternal or parental leave at the time of study.

## Covariates

The covariates of this study were age (19~29, 30~39, 40~49, or 50~55), education (middle school or below, high school, or below or university or above), income level (Q1~Q4), household composition (one, two, or three generation household), objectively measured body mass index [BMI (BMI < 18.5, 18.5 ≤ BMI < 25.0, 25.0 ≤ BMI < 30.0)], subjective health status (fair or poor), stress (no or yes), healthy lifestyle habit (no or yes), depressive symptoms (no or yes), job classification (white-collar, blue-collar, pink-collar, or unemployed), marital status (married, divorced, widowed, or separated, or single), and region (urban or rural). Various sociodemographic variables were incorporated in the analysis as they may act as potential contributing factors in giving childbirth in women. Individuals were categorized into the "yes" healthy lifestyle habit group if they were current non-smokers, not high-risk alcohol users, and engaged in at least 30 minutes of walking or physical activity for over 4 days per week. Depressive symptoms were measured using the Patient Health Questionnaire (PHQ-9) as this tool has been widely used in different population-based studies. This study utilized the Korean version of the PHQ-9, which has been previously validated.<sup>21,22</sup> Region was classified into urban or rural based on the participants' registered administrative district.

## Statistical Analysis

The general characteristics of the study population were examined using the chi-square test to identify significant differences between groups. Multivariable logistic regression analysis was performed to investigate the association

between recent experiences of childbirth and sleep quality while controlling for the potential confounding variables. Results were expressed as Odds Ratio (OR) and their 95% Confidence Interval (95% CI). Subgroup analysis was performed based on healthy lifestyle habit. All analyses were conducted using the SAS 9.4 (SAS Institute, Cary, NC, USA) software. P-values were two-sided and considered significant at  $p < 0.05$ .

## Ethical Approval

The Korea Community Health Survey (KCHS) data are openly published. Participants' data were fully anonymized prior to release. Our study was excluded from the review list pursuant to Article 2.2 of the Enforcement Rule of Bioethics and Safety Act in Korea, since the data were exempted from IRB review. All procedures performed in studies involving human participants were in accordance with the ethical standards of the national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## Results

Table 1 presents the general characteristics of the study population. Of a total of 41,708 individuals, 16,877 (40.5%) participants expressed poor sleep quality. The percentage of individuals experiencing poor sleep quality was higher in women with a recent experience of childbirth (48.4%) than those without (40.0%). In terms of sociodemographic status, poor sleep quality was also more prevalent in individuals with fewer years of education, in lower income groups, in non-white collar jobs, and who have been separated. Regarding health, more participants in the "no" healthy lifestyle habit group reported poor sleep quality than those in the "yes" group. Poor sleep quality was also more commonly found in individuals with poor subjective health, stress, and depressive symptoms.

Table 2 shows the results of the association between recent experience of childbirth and poor sleep quality in women. Compared to individuals without a recent experience of childbirth, those with such an experience were more likely to experience poor sleep quality (OR 1.50, 95% CI 1.34–1.68). Odds of showing poor sleep quality decreased in participants with a healthy lifestyle (OR 0.87, 95% CI 0.82–0.91).

The results of the subgroup analysis on the association between recent experience of childbirth and poor sleep quality by lifestyle habit can be found in Table 3. The

**Table 1** General Characteristics of the Study Population

Variables	Total	Poor Sleep Quality (PSQI > 5)				P-value
		No		Yes		
<b>Recent experience of childbirth</b>						
No	39,234	23,554	(60.0)	15,680	(40.0)	<0.0001
Yes	2474	1277	(51.6)	1197	(48.4)	
<b>Age</b>						
19~29	8425	5131	(60.9)	3294	(39.1)	<0.0001
30~39	10,296	6011	(58.4)	4285	(41.6)	
40~49	13,464	8307	(61.7)	5157	(38.3)	
50~55	9523	5382	(56.5)	4141	(43.5)	
<b>Education</b>						
Middle school or below	1005	475	(47.3)	530	(52.7)	<0.0001
High school	20,320	11,774	(57.9)	8546	(42.1)	
University or above	20,383	12,582	(61.7)	7801	(38.3)	
<b>Income</b>						
Q1	10,419	5699	(54.7)	4720	(45.3)	<0.0001
Q2	7296	4258	(58.4)	3038	(41.6)	
Q3	13,353	8273	(62.0)	5080	(38.0)	
Q4	10,640	6601	(62.0)	4039	(38.0)	
<b>Household composition</b>						
One generation household	9701	5666	(58.4)	4035	(41.6)	0.0322
Two generation household	28,713	17,204	(59.9)	11,509	(40.1)	
Three generation household	3294	1961	(59.5)	1333	(40.5)	
<b>Objectively measured body mass index</b>						
Underweight (BMI < 18.5)	3050	1792	(58.7)	1258	(41.3)	<0.0001
Normal (18.5 ≤ BMI < 25.0)	29,307	17,828	(60.8)	11,479	(39.2)	
Obesity (25.0 ≤ BMI < 50.0)	9351	5211	(55.7)	4140	(44.3)	
<b>Subjective health status</b>						
Good	17,301	12,217	(70.6)	5084	(29.4)	<0.0001
Poor	24,407	12,614	(51.7)	11,793	(48.3)	
<b>Stress</b>						
No	30,193	20,029	(66.3)	10,164	(33.7)	<0.0001
Yes	11,515	4802	(41.7)	6713	(58.3)	
<b>Healthy lifestyle habit</b>						
No	25,250	14,629	(57.9)	10,621	(42.1)	<0.0001
Yes	16,458	10,202	(62.0)	6256	(38.0)	
<b>Depressive symptoms</b>						
No	40,290	24,692	(61.3)	15,598	(38.7)	<0.0001
Yes	1418	139	(9.8)	1279	(90.2)	
<b>Job classification</b>						
White-collar worker	13,125	8194	(62.4)	4931	(37.6)	<0.0001
Pink-collar worker	7853	4652	(59.2)	3201	(40.8)	
Blue-collar worker	5515	3279	(59.5)	2236	(40.5)	
Unemployed	15,215	8706	(57.2)	6509	(42.8)	

(Continued)

**Table I** (Continued).

Variables	Total	Poor Sleep Quality (PSQI > 5)				P-value
		No		Yes		
<b>Marital status</b>						
Married	28,557	17,107	(59.9)	11,450	(40.1)	<0.0001
Divorced, widowed, or separated	3258	1655	(50.8)	1603	(49.2)	
Single	9893	6069	(61.3)	3824	(38.7)	
<b>Region</b>						
Urban	28,743	16,919	(58.9)	11,824	(41.1)	<0.0001
Rural	12,965	7912	(61.0)	5053	(39.0)	
<b>Total</b>	41,708	24,831	(59.5)	16,877	(40.5)	

trends of the main findings were generally maintained as individuals with a recent experience of childbirth had higher likelihoods of experiencing poor sleep quality. At the same time, the extent of such difference was reduced in individuals with a healthy lifestyle (OR 1.29, 95% CI 1.07–1.56) than those without (OR 1.63, 95% CI 1.41–1.88), inferring that lifestyle habits may partially moderate the relationship between childbirth experience and poor sleep quality.

## Discussion

The findings of this study present that a recent experience of childbirth is associated with an increased likelihood of undergoing poor sleep quality using a large, nationally representative data on South Korean women. Moreover, as the degree of this relationship found was reduced in individuals with a healthy lifestyle (not smoking, not engaging in high-risk alcohol use, and walking or exercising for at least 30 minutes per day, 5 days a week), the results suggest the potential effects of lifestyle habit in postnatal women. The results are in accordance with many existing studies which have reported prevalent poor sleep quality and insufficient sleep in individuals during and after pregnancy.<sup>23</sup> Women generally report highest levels of exhaustion during the first three postpartum months, with around 40% of women reporting sleep disturbances at two years postpartum.<sup>11,24</sup> As for studies conducted in Asia, most have focused on investigating sleep quality and duration in pregnant women. For instance, a previous Chinese cross-sectional study has presented that poor quality of sleep occurs commonly during pregnancy. Likewise, a study conducted in South Korea has shown that sleep quality tends to gradually

worsen as women reach their later months of pregnancy.<sup>25,26</sup> Hence, sleep disturbances can be seen as frequently expressed concerns among postpartum women.<sup>27</sup>

The association between childbirth experience and sleep quality may be explained by the fact that sleep quality in women is related to alterations in hormonal levels, including fluctuations that may occur due to the stress of bearing different roles in the transitional stages instantly after childbirth.<sup>28</sup> In fact, women may be distressed as they integrate the new role of parenthood into their pre-existing responsibilities following the addition of a new family member.<sup>10,29</sup> Demands of a new role, parenthood, may decrease sleep quality resulting from changes in duties and increased strains and worries. Poor postpartum sleep may also involve children's dependence on nocturnal feedings and other necessary caretaking activities.<sup>23</sup> Additionally, physical pain following delivery may also be an influencing factor, particularly as cesarean section women report more frequent sleep disturbances than women who gave natural childbirth.<sup>13,30</sup>

This study also investigated the relationship between recent childbirth and sleep quality according to lifestyle habit. Components of the “healthy lifestyle habit” variable, which are current smoking status, high-risk alcohol behavior engagement status, and regular walking or exercise status, are known risk factors for poor sleep quality.<sup>12–14</sup> The main findings on childbirth experience and sleep quality were generally maintained regardless of having a healthy lifestyle, although the degree of difference between postnatal women and their counterparts was slightly reduced in participants with a healthy lifestyle. This is noteworthy as it infers that in addition to women

**Table 2** Results of the Multivariable Logistic Regression Analysis of the Association Between Recent Experience of Childbirth and Poor Sleep Quality

Variables	Adjusted-OR*	Poor Sleep Quality (PSQI > 5)		
		95% CI		
<b>Recent experience of childbirth</b>				
No	1.00			
Yes	1.50	1.34	-	1.68
<b>Age</b>				
19~29	1.00			
30~39	1.06	0.96	-	1.16
40~49	0.99	0.89	-	1.09
50~59	1.13	1.01	-	1.26
<b>Education</b>				
Middle school or below	1.00			
High school	0.70	0.58	-	0.86
University or above	0.63	0.52	-	0.77
<b>Income</b>				
Q1	1.00			
Q2	0.92	0.84	-	1.00
Q3	0.90	0.84	-	0.99
Q4	0.91	0.83	-	1.05
<b>Household composition</b>				
One generation household	1.00			
Two generation household	0.98	0.92	-	1.05
Three generation household	1.02	1.01	-	1.15
<b>Objectively measured body mass index</b>				
Normal (18.5 ≤ BMI < 25.0)	1.00			
Underweight (BMI < 18.5)	1.01	0.91	-	1.12
Obesity (25.0 ≤ BMI < 50.0)	1.08	1.01	-	1.15
<b>Subjective health status</b>				
Good	1.00			
Poor	1.91	1.81	-	2.02
<b>Stress</b>				
No	1.00			
Yes	2.26	2.13	-	2.40
<b>Healthy lifestyle habit</b>				
No	1.00			
Yes	0.87	0.82	-	0.91
<b>Depressive symptoms</b>				
No	1.00			
Yes	8.40	6.70	-	10.53
<b>Job classification</b>				
White-collar worker	1.00			
Pink-collar worker	1.02	0.94	-	1.11
Blue-collar worker	1.02	0.92	-	1.12
Unemployed	1.11	1.04	-	1.19

(Continued)

**Table 2** (Continued).

Variables	Adjusted-OR*	Poor Sleep Quality (PSQI > 5)		
		95% CI		
<b>Marital status</b>				
Married	1.00			
Divorced, widowed, or separated	1.22	1.10	-	1.36
Single	0.99	0.90	-	1.08
<b>Region</b>				
Urban	1.00			
Rural	0.97	0.91	-	1.04

**Note:** \*Adjusted for age, education, income, household composition, objectively measured body mass index, subjective health status, stress, depressive symptoms, job classification, marital status, and region.

**Table 3** The Results of Subgroup Analysis of the Association Between Recent Experience of Childbirth and Poor Sleep Quality by Healthy Lifestyle Habit

Variables		Adjusted-OR*	Poor Sleep Quality (PSQI > 5)		
			95% CI		
<b>Healthy lifestyle habit</b> No	Recent experience of childbirth				
	No	1.00			
	Yes	1.63	1.41	-	1.88
Yes	No	1.00			
	Yes	1.29	1.07	-	1.56

**Note:** \*Adjusted for age, education, income, household composition, objectively measured body mass index, subjective health status, stress, depressive symptoms, job classification, marital status, and region.

with recent childbirth experience being more likely to experience poor sleep quality, such likelihoods may escalate in those not carrying out healthy behavior practice. Adequately monitoring these individuals may hence be important, especially considering that Asian countries report the most rapid and serious increases in sleep disorders.<sup>7</sup> The potential benefits of not smoking, disengaging in high-risk alcohol behavior, and walking or exercising on a regular basis in improving sleep quality should be highlighted based on the protective effects of healthy practice behavior shown in postpartum women.

The findings are noteworthy because total fertility rates (TFRs) have remained particularly low in many East Asian countries, including Korea.<sup>31</sup> A combination of noticeable improvements in women's status, such as higher education attainment and employment rates, and high domestic gender inequality has been cited as the main contributing factor.<sup>32</sup> This is because Korea is an example in which rapid changes in the society have taken place as a result of its fast-economic growth unseen in most other countries.<sup>33</sup>

Hence, the demands of the new role of parenthood accompanying childbirth may be particularly stressed in Korea. Although a paid maternity leave and a partially paid parental leave are legally guaranteed, many women often express difficulty in combining work and family. Furthermore, little nighttime support is known to negatively influence sleep quality in postpartum women.<sup>34</sup> Hence, women may be at a particular risk of experiencing poor sleep quality after childbirth, inferring the importance of reporting and monitoring this indicator.

This study was not without its limitations. First, the findings do not necessarily infer a causal association as this study was cross-sectional in design. Second, the specific timing of childbirth (eg, 1 month postpartum, etc.) could not be considered. Third, the possibility of residual confounding cannot be completely ruled out. For instance, information on snoring, nighttime breastfeeding, and mother parity was not measured in the data used. Information on sleep disorders was also unavailable and hence, individuals with a previous diagnosis could not be

excluded nor this variable considered as a covariate. Information on the participants' current professional status, including whether they were on maternity, could also not be considered. Fourth, lifestyle habits were measured based on smoking, alcohol drinking, and physical activity but the frequency of women with childbirth experience in the past year currently smoking and drinking was low, at around 2% and 5%. Last, sleep quality was using the Korean version of the PSQI, which has been proven for its validity and reliability. Although this is a comprehensive scale, scoring above the cut-off does not necessarily imply a clinical diagnosis. However, despite the limitations stated above, this study offers new insights by using a community-based design and included a large, nationally representative sample of women. The findings add evidence that recent experience in childbirth is associated with poor sleep quality, inferring the need to monitor and implement previously assessed interventions that may enhance sleep in postpartum women.<sup>35</sup>

## Conclusions

Recent experience of childbirth was associated with higher likelihoods of poor sleep quality in women. The degree of risks found was reduced in individuals with healthy practice behavior, referring to those who do not smoke, do not participate in high-risk alcohol behavior, and walks or exercises for at least 30 minutes per day, 5 days or more per week. The findings of this study infer the need to monitor and address sleep-related disturbances commonly reported among postpartum women.

## Abbreviations

PSQI, Pittsburgh sleep quality index; PHQ-9, patient health questionnaire-9; BMI, body mass index.

## Data Sharing Statement

Data will be made available on request. The dataset is available on the Korea Community Health Survey website (<https://chs.cdc.go.kr/chs/rdr/rdrInfoProcessMain.do>).

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## Disclosure

The authors declare no competing interests.

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