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The association between episodes of night eating and levels of depression in the general population

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Abstract

Objective: Research has suggested that a correlation may exist between depressive mood and episodes of night eating. This study aimed to examine whether having episodes of night eating was associated with increased levels of depression.

Method: This study used data from the 2019 Korea Community Health Survey and the study population consisted of adults aged ≥19 years. Depression levels were measured using the Patient Health Questionnaire-9. We investigated the patients' general characteristics using t-tests and analysis of variance. The association between depression levels and episodes of night eating was analyzed using a multivariable linear regression analysis. Subgroup analysis was conducted based on daily sleep duration.

Results: We analyzed 34,358 individuals and found higher average depression scores (β: 4.99, $p < .001$) in those with episodes of night eating than those without. Large effect sizes were found for differences in depression scores between participants with and without episodes of night eating. The magnitude of this increase was particularly pronounced in individuals who reported 9 or more hours of sleep per day.

Discussion: An association was found between levels of depression and episodes of night eating as individuals with episodes of night eating were more likely to have higher depression scores. Our findings suggest the potential need to consider night eating when addressing the mental health of the general population.

KEYWORDS
depression, eating, feeding and eating disorders, night eating syndrome, sleep

1 | INTRODUCTION

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) necessitates the presence of five or more symptoms to diagnose depression, in which one must be a depressed mood or anhedonia (Tolentino & Schmidt, 2018). Depression is one of the leading causes of disability and a known contributor to the global burden of disease and has the potential to significantly impact quality of life or survival (Wang et al., 2017). Since depression is also linked to suicide risk, examining the various risk factors associated with depression is

important (Bachmann, 2018). This phenomenon is particularly true for South Korea which ranked first among the Organization for Economic Cooperation and Development (OECD) countries in suicide rates (Orgnaziation for Economic Cooperation and Development, 2019).

An emerging factor associated with increased depressive symptoms is episodes of night eating (Guo, Tian, Cui, & Huang, 2020). The night eating syndrome is included in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), described as a condition of recurrent episodes of nocturnal eating or excessive food intake after an evening meal (Cleator, Abbott, Judd, Sutton, & Wilding, 2012). Previous studies report that the night eating syndrome is prevalent in around 1%–1.5% of the general population (Borges, dos Santos

Figueiredo, & Souto, 2017). An association has been found between depression and episodes of night eating in previous studies, including a cross-sectional study on Chinese college students in which a positive association between episodes of night eating, as measured by the Night-Eating Questionnaire (NEQ), and depression scores on the Self-rating Depression Scale (SDS) was observed (Guo et al., 2020). Likewise, similar associations have been found in previous studies targeting a selected group of individuals, including Italian adolescents and Japanese middle-aged adults (Huang et al., 2017; Riccobono, Pompili, Iannitelli, & Pacitti, 2019). However, this subject requires extensive research in the future because it was rarely investigated in the general population. Furthermore, this topic has been examined by few studies in East Asian populations, including Korea (Lee & Shin, 2019).

Apart from episodes of night eating, sleep duration is also a crucial factor in the development of various diseases and increased all-cause mortality, which refers to death from any cause (Gallicchio & Kalesan, 2009). Sleep is essential in daily life as it promotes the down-regulation of synaptic strengthening in the brain that occurs when individuals are awake to adapt to the constantly changing environment (Kim, Oh, Joo, Choi, & Park, 2019). Both short and excessive sleep hours have been associated with mental health and have been reported to increase the risk of depression in adults (Jing, Xu, Rong, Lai, & Fang, 2020; Zhai, Zhang, & Zhang, 2015). Hence, the degree of association between depression and the episodes of night eating may be different depending on daily sleep duration and requires investigation.

The purpose of this study was to analyze the relationship between depression and episodes of night eating in Korean adults. Subgroup analysis was performed based on sleep duration. The hypothesis was that individuals with episodes of night eating would be more likely to have depressive symptoms. We also hypothesized that this association would be maintained regardless of sleep duration, but that the magnitude of this association would be stronger individuals who report longer or shorter than average daily sleep hours.

2 | METHODS

2.1 | Data and study population

The present study evaluated data from the 2019 Korea Community Health Survey (KCHS), which was conducted by the Korea Centers for Disease Control and Prevention. The KCHS is a cross-sectional study that collects reliable health-related data. Additionally, it was conducted in 254 local districts, and the target population in each area was about 900 adult residents (aged ≥19 years). The KCHS used a two-stage sampling process. The first stage involved the application of the probability proportional to size sampling method (to select primary sampling units) and the second stage was the application of systematic sampling (selecting households). The survey is conducted annually and collects information through in-person interviews. Since

the population sample was extracted from the national survey data, the samples are representative of the Korean population (Kang et al., 2015).

The KCHS inquired and collected information on all variables, including depression, from the entire study population. However, information on episodes of night eating, measured using the Night Eating Questionnaire (NEQ), was collected only from residents of the Gyeonggi province. With the consideration of investigating episodes of night eating nationwide, the NEQ was surveyed on a trial basis in the Gyeongg province because it is the most populous region of Korea that physically surrounds the capital city Seoul and consists of both large, urban cities and rural regions. It is known for its demographically, socioeconomically, and geographically diverse composition of residents that largely resembles the characteristics of the entire Korean population. Thus, this study used information collected from this province in the KCHS.

This study included individuals aged ≥19 years. From an initial total of 41,872 potential participants, respondents without data on the relevant variables were excluded. Finally, 34,358 individuals were included in this study (Figure 1).
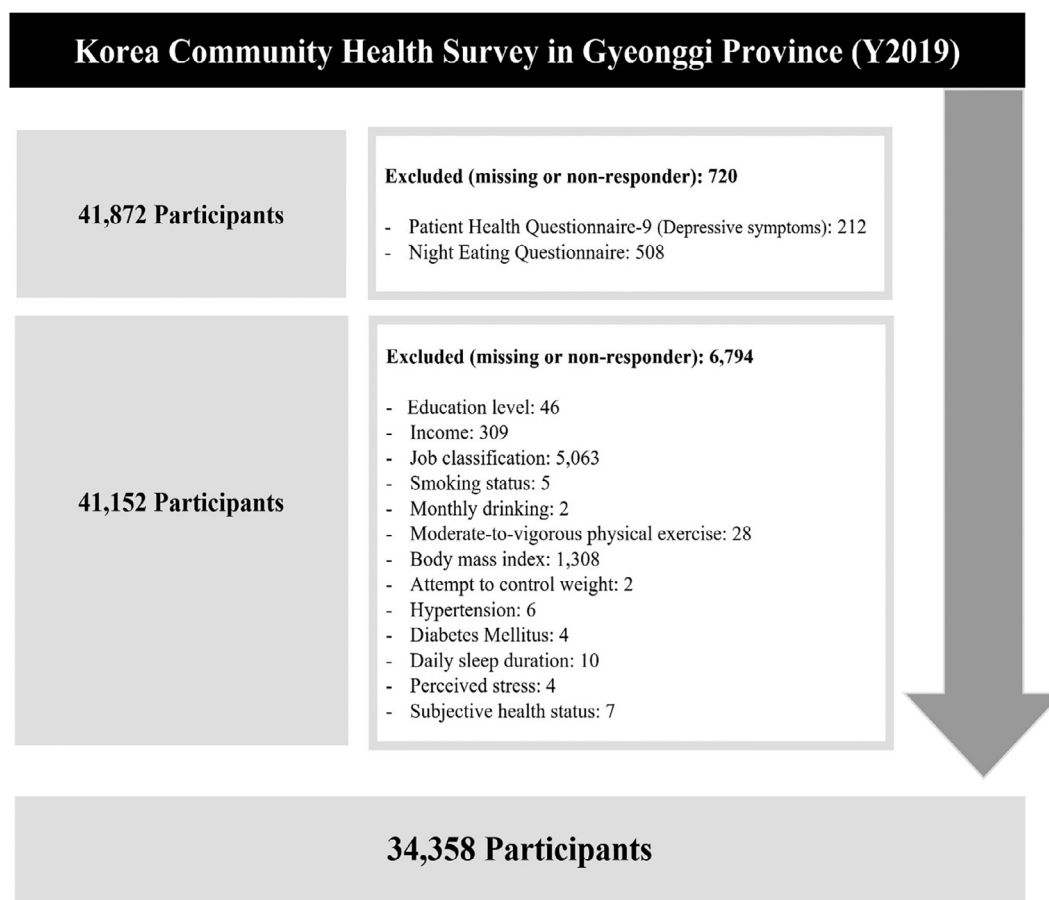
2.2 | Dependent variable

The dependent variable was depression scores, measured using the Korean version of the Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 has been widely utilized in many countries to screen and detect depression (Kung et al., 2013). Higher scores indicated more severe levels of depressive symptoms. The validity and reliability of the Korean version of the PHQ-9 have been previously verified (Han et al., 2008).

2.3 | Independent variable

The main independent variable was episodes of night eating, which was surveyed using the Korean version of the NEQ. The NEQ is a 14-item questionnaire frequently used to assess behavioral and psychological symptoms of night eating. Responses were measured on a 5-point Likert scale (0 = not at all, 4 = extremely) and a cutoff of 25 points was applied based on previous studies (Olejniczak et al., 2018; Sevincer, Ince, Taymur, & Konuk, 2016). Scores range from 0 to 52 points in the NEQ. The validity of the Korean version of the NEQ was tested in a previous study, which concluded that validity of this scale was evident (Cronbach's alpha = .78) (B. Kim, Kim, & Choi, 2016).

Various demographic, socioeconomic, and health-related variables were incorporated as confounding variables. These included sex (male or female), age (19–29, 30–39, 40–49, 50–59, 60–69, 70 or above years), educational level (none, elementary school, middle school, high school, or college or above), income (quartiles), job classification (professional or administrative position, office work, sales and service, agriculture and fishery, blue collar work or simple labor, or unemployed), generational household composition (one, two, or three

Korea Community Health Survey in Gyeonggi Province (Y2019)

41,872 Participants

Excluded (missing or non-responder): 720

- Patient Health Questionnaire-9 (Depressive symptoms): 212
- Night Eating Questionnaire: 508

41,152 Participants

Excluded (missing or non-responder): 6,794

- Education level: 46
- Income: 309
- Job classification: 5,063
- Smoking status: 5
- Monthly drinking: 2
- Moderate-to-vigorous physical exercise: 28
- Body mass index: 1,308
- Attempt to control weight: 2
- Hypertension: 6
- Diabetes Mellitus: 4
- Daily sleep duration: 10
- Perceived stress: 4
- Subjective health status: 7

34,358 Participants

FIGURE 1 The study population selection process

generation household), area of residence (urban or rural), smoking status (no or yes), monthly drinking status (no or yes), moderate to vigorous physical exercise (no or yes), body mass index (BMI) (underweight [<18.5], normal [18.5–25.0], or obese [≥25.0]) (World Health Organization, 2000), weight control attempt (no or yes), hypertension (no or yes), diabetes mellitus (no or yes), daily sleep duration (≤6 hr, 7–8 hr, ≥9 hr), perceived stress (no or yes), and subjective health status (poor or fair). Daily sleep duration was measured through an open-ended question, "How many hours do you sleep on average?" Daily sleep duration grouped as ≤6 hr, 7–8 hr, and ≥9 hr based on a statement by the American Academy of Sleep Medicine (AASM) and the Sleep Research Society (SRS) to promote optimal health (Watson et al., 2015). Specifically, a consensus statement was made that short sleep hours (less than 7 hr per day) is related to adverse health outcomes and that the health risk of long sleep hours (over 9 hr per day) is uncertain (Watson et al., 2015). Hypertension and diabetes were measured based on whether individuals were diagnosed with this disease by a physician. Physical exercise was measured using the International Physical Activity Questionnaire, in which individuals who conducted ≥150 min of moderate level physical exercise per week or ≥75 min of vigorous physical exercise per week were categorized into the "yes" group and those who have not conducted such level of exercise into the "no" group.

2.4 | Statistical analysis

We measured the general characteristics of the study participants using t-tests and analysis of variance (ANOVA). The general characteristics and mean PHQ-9 scores (mean ± standard deviation, SD) of the study population were shown based on sociodemographic, economic, and health related characteristics. The general characteristics between individuals with and without episodes of night eating were also additionally analyzed and shown in the supplementary table (Supplementary Tables S1 and S2). Additionally, Cohen's d and partial eta-squared (η^2), an effect-size measure, were calculated. These values estimate the degree of association for the sample. The association between depression scores and episodes of night eating was analyzed using a multivariable regression analysis. This analysis examined whether the depression levels of individuals who met the NEQ cutoff score of 25 points was higher than those who did not. A supplementary analysis was conducted after excluding questions 6 (depressive symptomology), 8 (sleep related troubles), or 6 and 8 from the NEQ as these items were similar in content to the questions asked in the PHQ-9 to measure depressive symptomology (Supplementary Table S3). Subgroup analysis was conducted based on sleep duration classified into groups: 6 hr or less, 7–8 hr, and 9 hr or more of sleep. All regression analyses were conducted after adjusting for all

TABLE 1 General characteristics of the study participants

Variables	Total		Depression scores		Effect size (95% CI)[a]	
	N	%	Mean ±SD	p value	Cohen's d	Partial η^2
Episodes of night eating						
No (NEQ < 25)	34,161	99.4	2.08 ± 2.98	<.001	−2.33 (−2.475, −2.193)	−
Yes (NEQ ≥25)	197	0.6	9.11 ± 6.49			
Sex						
Male	16,672	48.5	1.76 ± 2.67	<.001	−0.23 (−0.252, −0.210)	−
Female	17,686	51.5	2.46 ± 3.34			
Age						
19–29	5,478	15.9	2.02 ± 3.01	<.001	−	0.01 (0.011, 0.016)
30–39	4,975	14.5	2.16 ± 3.06			
40–49	6,603	19.2	1.89 ± 2.70			
50–59	6,934	20.2	1.87 ± 2.70			
60–69	5,255	15.3	2.00 ± 2.97			
70+	5,113	14.9	2.94 ± 3.82			
Educational level						
None	1,493	4.4	3.91 ± 4.63	<.001	−	0.02 (0.019, 0.026)
Elementary school	3,003	8.7	2.77 ± 3.66			
Middle school	2,987	8.7	2.29 ± 3.32			
High school	13,299	38.7	1.96 ± 2.86			
College or above	13,576	39.5	1.89 ± 2.71			
Income						
Q1	8,549	24.9	2.84 ± 3.85	<.001	−	0.03 (0.026, 0.033)
Q2	7,169	20.9	2.06 ± 2.93			
Q3	9,881	28.8	1.85 ± 2.67			
Q4	8,759	25.5	1.76 ± 2.52			
Job classification						
Professional or administrative position	5,157	15.0	1.89 ± 2.73	<.001	−	0.01 (0.007, 0.011)
Office work	4,000	11.6	1.85 ± 2.59			
Sales and service	4,977	14.5	2.01 ± 2.75			
Agriculture and fishery	712	2.1	1.67 ± 2.50			
Blue collar work or simple labor	6,655	19.4	1.86 ± 2.68			
Unemployed	12,857	37.4	2.49 ± 3.55			
Generational household composition						
1 generation household	12,872	37.5	2.35 ± 3.33	<.001	−	0.00 (0.002, 0.005)
2 generation household	18,898	55.0	1.98 ± 2.85			
3 generation household	2,588	7.5	1.99 ± 2.99			
Area of residence						
Urban	26,974	78.5	2.13 ± 3.01		0.02 (−0.003, 0.049)	−
Rural	7,384	21.5	2.06 ± 3.22	<.001		
Smoking status						
No	27,892	81.2	2.11 ± 3.04	.2694	−0.02 (−0.043, 0.012)	−
Yes	6,466	18.8	2.16 ± 3.11			
Monthly drinking status						
No	15,042	43.8	2.34 ± 3.31	<.001	0.13 (0.110, 0.153)	−
Yes	19,316	56.2	1.94 ± 2.82			

TABLE 1 (Continued)

Variables	Total		Depression scores		Effect size (95% CI)[a]	
	N	%	Mean ±SD	p value	Cohen's d	Partial η²
Moderate-to-vigorous physical exercise						
No	26,797	78.0	2.20 ± 3.14	<.001	0.12 (0.092, 0.143)	—
Yes	7,561	22.0	1.84 ± 2.72			
Body mass index						
Underweight (BMI < 18.5)	1,581	4.6	2.79 ± 3.82	<.001	—	0.00 (0.002, 0.004)
Normal (18.5 ≤ BMI < 25.0)	20,943	61.0	2.05 ± 2.99			
Obese (BMI ≥ 25.0)	11,834	34.4	2.15 ± 3.05			
Attempt to control weight						
No	12,623	36.7	2.27 ± 3.28	<.001	0.08 (0.057, 0.101)	—
Yes	21,735	63.3	2.03 ± 2.91			
Hypertension						
No	26,486	77.1	2.01 ± 2.92	<.001	−0.15 (−0.179, −0.129)	—
Yes	7,872	22.9	2.48 ± 3.45			
Diabetes mellitus						
No	31,127	90.6	2.06 ± 2.99	<.001	−0.21 (−0.243, −0.170)	—
Yes	3,231	9.4	2.69 ± 3.60			
Daily sleep duration						
≤6 hr	16,221	47.2	2.54 ± 3.41	<.001	—	0.02 (0.017, 0.023)
7–8 hr	17,033	49.6	1.69 ± 2.55			
≥9 hr	1,104	3.2	2.58 ± 3.74			
Perceived stress						
No	25,727	74.9	1.48 ± 2.19	<.001	−0.89 (−0.91, −0.86)	—
Yes	8,631	25.1	4.01 ± 4.25			
Subjective health status						
Poor	21,475	62.5	2.64 ± 3.43	<.001	0.47 (0.448, 0.492)	—
Fair	12,883	37.5	1.24 ± 2.01			
Total	34,358	100.0	2.12 ± 3.05			

Abbreviations: NEQ, Night Eating Questionnaire; SD, Standard Deviation.
[a]Effect size was measured using Cohen's d for t-test and partial eta-squared (η²) for ANOVA analyses. For Cohen's d, the categorical values for small, medium, and large effect sizes are 0.2, 0.5, and ≥ 0.8, whereas 0.01, 0.06, and ≥ 0.14 are suggested for partial eta-squared.

covariates. The values of p were two-sided and considered significant at $p < .05$. Analyses were performed using the SAS 9.4 software (SAS Institute, Cary, NC, USA).

2.5 | Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Korea Community Health Survey (KCHS) are open data where all personal information is fully anonymized before release. This study was from the review list pursuant to Article 2.2 of the Enforcement Rule of Bioethics and Safety Act in Korea, since the data was exempted from IRB review.

3 | RESULTS

The general characteristics of the study population are shown in Table 1, along with the effect size by Cohen's d and partial eta-squared. The study population consisted of 34,358 adults and the depression scores were 2.12 ± 3.05 (mean ± SD). A total of 197 (0.6%) achieved a score of 25 or more on the NEQ, indicating episodes of night eating. Higher average PHQ-9 scores were found in individuals with experiences of night eating compared to those without such experiences (no: 2.08 ± 2.98; yes: 9.11 ± 6.49; p value: <.001). Large effect sizes were found for differences in PHQ-9 scores between participants with and without episodes of night eating ($d = -2.33$, 95% CI $= -2.475$ to -2.193). Similarly, individuals who

TABLE 2 The association between depression scores and episodes of night eating

Variables	Depression scores[a]		
	Adjusted-β[a]	SE	p value
Episodes of night eating			
No (NEQ < 25)	Ref.		
Yes (NEQ ≥ 25)	4.99	0.48	<.001
Sex			
Male	Ref.		
Female	.60	0.04	<.001
Age			
1929	Ref.		
30–39	−.08	0.06	.215
40–49	−.30	0.06	<.001
50–59	−.35	0.06	<.001
60–69	−.45	0.07	<.001
70+	−.07	0.09	.462
Educational level			
None	Ref.		
Elementary school	−.53	0.13	<.001
Middle school	−.72	0.14	<.001
High school	−.95	0.13	<.001
College or above	−.96	0.13	<.001
Income			
Q1	Ref.		
Q2	−.26	0.06	<.001
Q3	−.45	0.06	<.001
Q4	−.50	0.07	<.001
Job classification			
Professional or administrative position	Ref.		
Office work	−.04	0.06	.468
Sales and service	−.03	0.06	.590
Agriculture and fishery	−.32	0.11	.005
Blue collar work or simple labor	−.01	0.06	.874
Unemployed	.18	0.06	.001
Generational household composition			
1 generation household	Ref.		
2 generation household	−.16	0.05	.001
3 generation household	−.25	0.08	.002
Area of residence			
Urban	Ref.		
Rural	.16	0.06	.004
Smoking status			
No	Ref.		
Yes	.21	0.05	<.001
Monthly drinking status			
No	Ref.		
Yes	.00	0.04	.920

(Continues)

TABLE 2 (Continued)

Variables	Depression scores[a]		
	Adjusted-β[a]	SE	p value
Moderate-to-vigorous physical exercise			
No	Ref.		
Yes	.03	0.04	.417
Body mass index			
Underweight (BMI < 18.5)	Ref.		
Normal (18.5 ≤ BMI < 25.0)	−.41	0.10	<.001
Obese (BMI ≥25.0)	−.38	0.10	.000
Attempt to control weight			
No	Ref.		
Yes	−.08	0.04	.035
Hypertension			
No	Ref.		
Yes	.08	0.05	.106
Diabetes mellitus			
No	Ref.		
Yes	.18	0.07	.009
Daily sleep duration			
≤6 hr	Ref.		
7–8 hr	−.45	0.03	<.001
≥9 hr	.03	0.12	.826
Perceived stress			
No	Ref.		
Yes	2.23	0.05	<.001
Subjective health status			
Poor	Ref.		
Fair	−.84	0.03	<.001

Abbreviations: NEQ, Night Eating Questionnaire; SE, standard error.
[a]Adjusted for sex, age, education level, income, job classification, generational household composition, area of residence, smoking status, monthly drinking status, moderate-to-vigorous physical exercise, body mass index, attempt to control weight, hypertension, diabetes mellitus, daily sleep duration, perceived stress, and subjective health status.

slept either for 6 hr or lesser (2.54 ± 3.41) or 9 hr or more per day (2.58 ± 3.74) had higher depression scores compared to those slept 7–8 hr per day (1.69 ± 2.55) with statistical significance (p value: <.001).

The results of the regression analysis on the association between depression scores and episodes of night eating are shown in Table 2. Compared to individuals without episodes of night eating, participants with such episodes (β: 4.99, p < .001) had higher depression scores, which implied higher levels of depressive symptoms. Similar tendencies were found in the supplementary analysis which excluded questions 6 (measures depressive symptomology), 8 (measures sleep related troubles), or 6 and 8 of the NEQ, as shown in Supplementary Table S3. Regarding sleep duration, participants who reported 7–8 hr of sleep per day (β: −0.45, p < .001) had lower depression scores than those who reported 6 hr or lesser, whereas no statistically significant

TABLE 3 Results of the subgroup analysis performed based on daily sleep duration

Variables		Depression scores[a]		
		Adjusted-β[a]	SE	p value
Daily sleep duration	Episodes of night eating			
≤6 hr	No (NEQ < 25)	Ref.		
	Yes (NEQ ≥ 25)	4.82	0.60	<.001
7–8 hr	No (NEQ < 25)	Ref.		
	Yes (NEQ ≥ 25)	4.74	0.78	<.001
≥9 hr	No (NEQ < 25)	Ref.		
	Yes (NEQ ≥ 25)	9.39	3.52	.008

Abbreviations: NEQ, Night Eating Questionnaire; SE, standard error.
[a]Adjusted for sex, age, education level, income, job classification, generational household composition, area of residence, smoking status, monthly drinking status, moderate-to-vigorous physical exercise, body mass index, attempt to control weight, hypertension, diabetes mellitus, perceived stress, and subjective health status.

differences were shown in individuals who slept 9 hr or more (β: .03, $p = .826$).

The results of the subgroup analysis performed based on daily sleep duration are shown in Table 3. The tendencies of the main findings on the relationship between depression scores and episodes of night eating were generally maintained regardless of daily hours of sleep. However, the magnitude of increase in depression scores in individuals who had episodes of night eating was particularly pronounced in the group where participants slept for 9 hr or more.

4 | DISCUSSION

This study investigated the relationship between the levels of depression and episodes of night eating in the Korean general population. Approximately, 0.6% of the participants had a score of 25 or above on the NEQ. Large effect sizes were found for differences in PHQ-9 scores between participants with and without episodes of night eating. Although other variables revealed relatively small effect sizes, such tendencies have been typically found in studies with large samples (Kerr et al., 2021; Owens et al., 2021). Such effect sizes may be a more accurate reflection in the general population and are most likely meaningful (Funder & Ozer, 2019). An association was found between levels of depression and NEQ scores, in which individuals with episodes of night eating were more likely to have higher depression scores. Furthermore, such tendencies were maintained regardless of daily sleep duration but were particularly pronounced in individuals who reported 9 hr or more hours of sleep per day.

Our findings suggest that episodes of night eating may be associated with higher depression scores, which is understandable considering that it tends to co-occur with mood disorders (Vander Wal, 2012). Our results were in accordance with previous studies that have investigated this subject in a targeted group of individuals. A study reported that NEQ correlated with worse scores on the Zung Depression Inventory and the Rosenberg Self-Esteem Scale in outpatients with obesity (Gluck, Geliebter, & Satov, 2001). Other studies on young

adults also presented that episodes of night eating, defined using the NEQ, correlated with depressive symptoms, measured using the SDS (Guo et al., 2020). Similarly, studies have stated that students who report night eating based on the NEQ were more commonly diagnosed with depression (Runfola, Allison, Hardy, Lock, & Peebles, 2014). A Japanese follow-up study on middle-aged adults showed that habitual snacking after dinner was linked to a higher incidence of depressive symptoms (Huang et al., 2017). Regarding studies on Korea, a cross-sectional study on nurses found that those who eat at night show a higher likelihood of self-reported depressive symptoms (O. S. Kim, Kim, Lee, & Jung, 2016). A study on Korea also revealed that night eating, which is referred to as the consumption of 25% or more of the total daily energy between 9 p.m. to 6 a.m., was associated with higher odds of being diagnosed with depression in women (Lee & Shin, 2019). The findings of our study add evidence to this subject by suggesting an association between depression scores and episodes of night eating in a general population of adults in Korea.

Our study found that the association between levels of depression and episodes of night eating was maintained regardless of the number of daily sleep hours, with the magnitude being particularly strong in individuals who slept 9 hr or more per day. A commonly found characteristic of the night eating syndrome is nocturnal consumption of food while being fully aware (O'Reardon, Peshek, & Allison, 2005). Interestingly, our results suggest the potential role of oversleeping, which may be partially linked to the poor health effects of impaired sleep. In fact, studies have demonstrated that individuals with short (6 or fewer hours of sleep per night) and long sleep duration (9 or more hours of sleep per night) were more likely to have depressive disorders (van den Berg et al., 2009). A meta-analysis of prospective studies on adults also reported a similar trend (Zhai et al., 2015). Under such circumstances, our findings suggest that individuals with episodes of night eating who sleep for long hours may be particularly vulnerable to depressive symptoms.

This study has some limitations. First, since this study used cross-sectional data, causal inferences should be made with caution. The findings only infer an association between depressive symptoms and

episodes of night eating. Hence, it is also possible that individuals with depressive symptoms are more likely to night eat and have poor sleep. It must also be taken into account that poor sleep, sleep duration, and poor appetite or overeating are part of a diagnostic criteria for depression. Hence, longitudinal studies are needed in the future to determine a causal relationship. Second, the NEQ in the KCHS was conducted for only adult participants who resided in the Gyeonggi province of Korea. However, as mentioned previously, this area had a diverse composition of residents. Hence, the results can be generalized to an extent. Third, daily sleep duration was measured based on self-reports in the KCHS due to its large sample size. Sleep duration may have been subject to recall bias as reports reveal that self-reported sleep duration tend to be overestimated, on an average of around 1 hr in the Chinese population (Jackson, Patel, Jackson, Lutsey, & Redline, 2018). Despite the limitations described above, this study offers important insights as it is the first to reveal an association between depression levels and episodes of night eating in the Korean general population. This study is also unique because it further analyzed how sleep duration potentially interplays in the relationship between depression levels and episodes of night eating.

In conclusion, an association was found between levels of depression and NEQ scores, in which individuals with episodes of night eating were more likely to have higher depression scores. Large effect sizes analyzed for differences in depression scores between participants with and without episodes of night eating may be an accurate reflection and are most likely meaningful. Also, the degree of the relationship found between higher levels of depression and episodes of night eating was particularly significant in individuals who overslept. The findings infer the potential need to consider night eating while addressing the mental health of the general population.

CONFLICTS OF INTEREST

The authors have no conflict to declare.

DATA AVAILABILITY STATEMENT

Data Availability Statement: None available

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