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Relationship between night eating syndrome and sleep quality among university students in Palestine

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Abstract

Background Night eating syndrome (NES) is an eating disorder in which at least one-third of one's daily caloric intake is consumed after the last meal of the day or throughout the nocturnal evening on at least two consecutive occasions each week. In the literature, the prevalence of NES among university students ranged from 4.2 to 15%.

Aim The purpose of this study was to find out how common NES is among Palestinian university students, as well as the association between NES, sleep quality, BMI, socioeconomic factors, and lifestyle factors.

Methods Students from An-Najah National University completed an online questionnaire. The Pittsburgh Sleep Quality Index (PSQI) and the Eating Questionnaire (NEQ) were employed.

Results A total of 333 participants took part in the study. The average age of the participants was 21.66 years (range: 16 to 33). The presence of NES was identified in 82.6% of the study subjects. There was no evidence of a link between NES and BMI, sociodemographic variables, or lifestyle factors. Higher scores on subjective sleep quality ($p < .01$), sleep latency ($p < .01$), and daytime dysfunction ($p < .05$) scores were found to be linked with NES. Additional to this, the NEQ scores were shown to be substantially connected with these scores, as well as the sleep duration scores ($p < .05$). Subjective sleep quality ($p < .01$) and sleep latency ($p < .01$) were revealed to be significant predictors of the NEQ score.

Conclusion NES was significantly related to sleep quality subscales among Palestinian university students. Moreover, subjective sleep quality and sleep latency predicted NEQ score.

Keywords Night eating syndrome, Sleep quality, BMI, Sociodemographic factors, Lifestyle

Introduction

Night eating syndrome (NES) is a type of eating disorder characterized by the consumption of at least one-third of one's daily caloric intake after the last meal of the day or throughout the nocturnal evening on at least two separate occasions per week (Kucukgoncu et al. 2014). (NES) also characterized by recurrent episodes of night eating, evident through excessive food consumption after the evening meal or eating after awakening from sleep, often associated with significant distress and/or impairment in functioning (Sakthivel et al. 2023).

The term "NES" was first used in 1955 (Stunkard et al. 1955). However, because the definition of NES has changed over time, there is no standardized definition for it. As a result, it has been difficult to obtain precise information about NES prevalence and to compare the outcomes of different studies (Kucukgoncu et al. 2014). The first diagnostic criteria of NES was established in

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1955 (Stunkard et al. 1955). NES is now classified in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) under the heading "Other Specified Feeding or Eating Disorder" (Association 2013). The presence NES does not appear to be secondary to any psychiatric disorder or dependency. Moreover, the night eating behavior is recognized in NES unlike the sleep-related eating disorder (SRED) (Vinai et al. 2012). NES is characterized by decreased appetite during the daytime and increased appetite (hyperphagia) during the evening and nighttime hours. Additionally, NES has been linked to changes in circadian rhythm, changes in mood, and other eating disorders (*Night Eating Syndrome (NES)*, 2021). Development of NES in university students is dependent on several factors, not limited to, transition from late adolescence to early adulthood, developmental stress, unhealthy eating habits (Riccobono et al. 2020), peer pressure, gender identity (Guo et al. 2020). The performance stress in academics, combined with emotional vulnerability and the uncertainty of prospective career, increases the propensity for depression, anxiety, and stress (Mohammad Miraj et al. 2022). The precise prevalence of NES in the general population remains somewhat elusive, with estimates ranging from 1.5 to 4.6%. This prevalence is notably higher in those with obesity (3–15%) and individuals with psychiatric conditions, particularly depression (up to 15%) (Sara Haneef et al., 2024). Early adulthood has been identified as the typical age for the onset of NES (Vander Wal 2012). NES prevalence among university students ranged from 4.2% in the United States and Malaysia (Runfola et al. 2014);(Dzulkafli et al., 2020) to 15% in Brazil (Borges et al. 2017).

The relationship between NES and BMI is up for debate. In some studies, obesity has been found to be associated with NES. Other studies, however, found no link between BMI and NES (Shoar et al. 2019);(Kaur et al. 2021).

A cross-sectional study conducted in Malaysia to study the association between NES, psychological distress, and sleep quality among university students showed that NES was significantly associated with psychological distress and sleep quality (Chow 2023). Similarly, NES was found to be significantly associated with poor sleep quality among university students in Malaysia (Gan et al. 2019). Sleep quality is a common term in sleep medicine that refers to a group of sleep measurements such as total sleep time, total wake time, sleep onset latency, efficiency of sleep, degree of fragmentation, and in some cases sleep disruptive events (Krystal and Edinger 2008). A recent systematic review looked at the sociodemographic factors related to NES. It has been discovered that the presence of NES was not affected by age. NES was also found to have no relationship with gender, educational level, income, having children, living with a spouse, or smoking (Kaur et al. 2021). Because of the psychological distress caused by the COVID-19 pandemic, it has been reported that the psychosocial impact of the disease has contributed to disordered eating behaviors such as uncontrolled and emotional eating (Ramalho et al. 2021). A cross-sectional research was conducted among 568 students (78.7% women) aged 18–25 years. Students completed a survey including demographic information, Pittsburgh Sleep Quality Index (PSQI), Eating Attitude Test-26 (EAT-26), Night Eating Questionnaire (NEQ), and Beck Depression Inventory (BDI). Anthropometric measurements were taken. Students were grouped based on poor (PSQI > 5) and good (PSQI ≤ 5) sleep quality. The results showed that there was a significant association between PSQI > 5 and NES after adjusting for age, sex, class standing, residency, smoking status, and alcohol consumption on logistic regression. Those results suggest that PSQI > 5 is a significant risk for the NES, but not other disordered eating behaviors or obesity (Suna, G et al., 2022). The primary goal of this study is to determine the prevalence of NES among Palestinian university students and the quality of their sleep during the second year of COVID-19 pandemic. The second objective is to investigate the relationship between NES, sleep quality, body mass index socio-economic and lifestyle factors.

Methods

Data and method

Study design

This cross-sectional study was conducted in June and July 2021 during the online taught summer semester, which is the shortest semester in the academic year. A structured online questionnaire was filled by students from the largest university in West Bank, Palestine, An-Najah National University. The online questionnaire was made on Google forms and shared via the university web portal "https://zajel.najah.edu" and courses web pages.

At the start of the questionnaire, a statement clarified that participation is voluntary.

Collected data included: socio-demographics, medical history and lifestyle, the Night Eating Questionnaire (NEQ), and Pittsburgh Sleep Quality Index (PSQI) questionnaire. Simple random sampling was used. Once the calculated sample size was reached accepting responses was stopped. The total number of completed responses was 336. After removing duplicated responses, 333 participants' responses were included in the data analysis.

Participant's characteristics

Palestinian students from An-Najah National University were included in the study. Participants who reported using psychiatric medication or experiencing psychological problems were excluded from the study, as were

participants who were not registered for the summer semester.

The sample size was calculated using G Power software. An alpha level of (0.05) was considered, as were two-sided *p*-values of (0.05) and (80%) power. The required sample size is 300 students. Considering the dropout rate of 5% and missing data, the sample size is considered to be 320 participants.

Collected data and study instruments

Socio-demographic information included: age, gender, marital status, living place, living nature, university year, college, family income, university fee payment. medical history and lifestyle information included: presence of chronic disease, surgery, medication, smoking, smoking type, weight, height, diet, diet time, diet reason, diet satisfaction, working out, walking, walking times per week, walking time duration (min), screen time for studying (hour), and screen time for leisure (hour). In this study, we used a back-to-back translated Arabic version of PSQI and NEQ.

The NEQ was used to assess the presence of NES among study participants. NEQ items include: hunger in the morning and timing of first meal (2 items), food cravings and control of eating behaviour before bedtime (2 items) and at the night-time awakenings (2 items), food eaten after dinner percentage (1 item), initial insomnia (1 item), nocturnal awakenings and ingestion of food frequency (3 items), and mood disturbance (2 items), and realization of nocturnal eating episodes (1 item). Each item has a 0–4 Likert's scale, except for item 7 that has a zero scored option: check here if your mood does not change during the day. The total NEQ score is calculated by reversing 1, 4, and 14 items' code. Then, By summing all items' scores except for item 13 as it does not assess a NES symptomatology degree. A total score equal or higher than 25 indicates the presence of NES (Allison et al. 2008). In this study NES had a high reliability with a Cronbach's alpha of 0.697.

For sleep quality and disturbances measurement, The Pittsburgh Sleep Quality Index (PSQI) was used. PSQI contains 19 self-rated items and additional 5 questions answered by by bed- or roommate (if exists). Only the self-rated questions are used for scoring. These questions' scores produce 7 "Component Scores". In this study we included the following component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, use of sleeping medication, and daytime dysfunction. Each of these component score has a 0–3 score range. Where a score of 0 indicates "No difficulty", and a score of 3 indicates "Severe difficulty (Buysse et al. 1989).

Data analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 23. Mean values and frequencies were calculated for sample description. Chi-square test and independent t-test were applied to evaluate the relationship between the presence NES and study variables. Pearson correlation and multiple linear regression tests were used to evaluate the relationship between NEQ scores and study variables. In the regression model, age and gender were not included in the model. This decision was made since the study sample consisted of homogeneous group in terms of age. Therefore, there was no need to adjust for age. Additionally, gender wasn't associated with NES, so it was not included in the model as well.

Results

Participants' characteristics

A total of 335 respondents participated in the study, only 333 included in the final analysis; two responses were excluded due to: one of them reported that he was take regular sleep medication and the other one reported he had a psychiatric problem. The participants' average age was 21 ± 2.66 years (range: 16 to 33).

Tables 1 and 2 indicate the sociodemographic and lifestyle characteristics of the participants.

NEQ scores and NES prevalence

The NEQ scores of the participants varied from 14 to 56, with a mean of 36.12 ± 9.15. According to NEQ, the prevalence of NES was 82.6% across the study population, with 275 persons having NES. Only 17.4% (58) of those surveyed said they didn't have it.

Sleep quality

Sleep quality index subscales mean scores were (1.12 ± 0.94) for subjective sleep quality, (1.49 ± 1.04) for sleep latency, (0.74 ± 1.02) for sleep duration, (0.65 ± 1.03) for habitual sleep efficiency, (0.26 ± 0.7) for use of sleep medications, and (1.25 ± 0.82) for daytime dysfunction.

NES and participants' characteristics

The relationships between NES and participants' sociodemographic, medical histroy and lifestyle factors are shown in Table 3. There was no relationship between NES and any sociodemographic or lifestyle factor. Correlation test was done between NEQ scores and participants' characteristics continuous variables (Table 4). NEQ scores were only significantly correlated with walking times per week ($p < .05$).

NES and sleep quality

Table 5 shows the relationships between the NES and sleep quality subscales. Subjective sleep quality ($p < .01$),

Table 1 Participants' socio-demographics

Variable		Total (*N* = 333)	
		Number (N)	Percentage (%)
Gender	Male	67	20.1
	Female	266	79.9
Marital Status	Single	295	88.6
	Married	28	8.4
	Other	10	3
Area of Living	City	167	50.2
	Villages and camps	166	49.8
Type of housing	With parents	283	85
	With relatives	4	1.2
	Student housing	12	3.6
	With spouse	27	8.1
	Other	7	2.1
Faculty	Agricultural & veterinary Medicine	82	24.6
	Arts	15	4.5
	Economy & social sciences	34	10.2
	Education	10	3
	Engineering & IT	38	11.4
	Graduate studies	14	4.2
	Human sciences	17	5.1
	Law	6	1.8
	Medicine & health sciences	82	24.6
	Physical education	3	0.9
	Religion	2	0.6
	Applied sciences	13	3.9
	Other	17	5.1
Academic year	1st	61	18.3
	2nd	57	17.1
	3rd	77	23.1
	4th	84	25.2
	Other	54	16.2
Family income	< 1500 NIS	25	7.5
	1500–3000 NIS	102	30.6
	3000–5000 NIS	99	29.7
	More than 5000 NIS	107	32.1
Study Funding	Family	277	83.2
	Scholarship	25	7.5
	Personal income	15	4.5
	Other	16	4.8

sleep latency ($p < .01$), and daytime dysfunction ($p < .05$) were all significantly associated with NES. The NEQ scores were compared to the sleep quality subscale scores in a correlation test (Table 6). Subjective sleep quality ($p < .01$), sleep latency ($p < .01$), sleep duration ($p < .05$), and daytime dysfunction ($p < .01$) were all significantly linked with NEQ scores.

The prediction of the NEQ score based on sleep quality subscales was evaluated using multiple linear regression. A significant regression equation was found ($F(4, 351) = 21.200$, $p < .01$), with an $R^2 = 0.135$.

Discussion

NES prevalence

This study successfully established the prevalence of NES and its relationship to socio-demographics, lifestyle, and sleep quality in a representative sample of Palestinian university students. NES was discovered in 82.6% of the research participants. This figure is considerably greater than the reported NES prevalence rates. NES was only found in 1.5% of an Omani Arab adult's sample (Zadjali et al. 2015). According to two studies, NES was identified in 10.3% and 9.5% of Saudi medical students (Ahmed et al. 2019);(Ahmad et al. 2019). In Malaysian university students, the prevalence of NES was 12.2% and 4.2% (Gan et al. 2019);(Dzulkafli et al., 2020). University students in the United States had a NES prevalence of 5.69% and 4.2% (Nolan and Geliebter 2012);(Runfola et al. 2014). 15% of Brazilian students enrolling in higher education institutions have NES. Furthermore, they discovered a link between NES and depression, anxiety, and stress in pupils (Borges et al. 2017).

It's important to keep in mind that this research took place in the middle of 2021, during the COVID-19 pandemic. This could have an impact on the presence of NES in the study sample. During the COVID-19 pandemic, NES was discovered to be linked to exhaustion, depression, and anger in Turkish athletes (Turgut et al. 2020). According to a Portuguese study, the COVID-19 pandemic's psychosocial impact may lead to disordered eating behaviors such as uncontrolled and emotional eating as a result of psychological distress (Ramalho et al. 2021). A cross-sectional study conducted in United Arab Emirates (UAE) during COVID-19 period found that, during the pandemic, 31% reported weight gain and 72.2% had less than eight cups of water per day. Furthermore, the dietary habits of the participants were distanced from the Mediterranean diet principles and closer to "unhealthy" dietary patterns. Moreover, 38.5% did not engage in physical activity and 36.2% spent over five hours per day on screens for entertainment. A significantly higher percentage of participants reported physical exhaustion, emotional exhaustion, irritability, and tension "all the time" during the pandemic compared to before the pandemic. Sleep disturbances were prevalent among 60.8% of the participants during the pandemic. Although lockdowns are an important safety measure to protect public health, results indicate that they might cause a variety of lifestyle changes, physical inactivity, and psychological problems among adults in the UAE (Cheikh Ismail et al., 2020). Furthermore, it is hypothesized that the unusual lifestyle imposed by COVID-19 quarantine resulted in

Table 2 Participants' lifestyle

Variable		Total (*N* = 333)	
		Number (*N*)	Percentage (%)
Chronic disease	Yes	13	3.9
	No	320	96.1
Surgery	Yes	66	19.8
	No	267	80.2
Medication	Yes	24	7.2
	No	309	92.8
Smoking	Non-smoker	266	79.9
	Irregular smoker	44	13.2
	Regular smoker	23	6.9
Reported type of smoking	Cigarette	16	22.9
	Pipe (shisha)	54	77.1
Diet	Yes	143	42.9
	No	190	57.1
Diet time	Currently	48	32.9
	Before & stopped	98	67.1
Reason of diet	Weight loss/gain	130	89.7
	Therapeutic diet	3	2.1
	Other	12	8.3
Losing/gaining weight	Yes	119	84.4
	No	22	15.6
Diet satisfaction	Yes	100	73.5
	No	36	26.5
Diet for other reason satisfaction	Yes	48	73.8
	No	17	26.2
Working out	Yes	123	36.9
	No	210	63.1
Walk	Yes	176	52.9
	No	157	47.1
BMI	Underweight	62	18.7
	Normal	148	44.7
	Overweight	76	23
	Obese	45	13.6
	Mean ± SD	**Range**	
Age	21 ± 2.66	(16–33)	
Walking times/week	3.8 ± 2.11	(1–7)	
Walking time (min)	55.48 ± 39.67	(10–270)	
Screen hours (study)	4.7 ± 3.14	(0–20)	
Screen hours (Fun)	5.47 ± 3.69	(0.5–23)	

cardician misalignment, altering eating and sleeping habits (Da Silva et al. 2020).

NES and BMI

According to BMI, 44.7% of the study participants were normal weight, 23% were overweight, 18.7% were underweight, and 13.6% were obese. In our sample, there was no evidence of a link between NES and BMI categories or scores. Furthermore, there was no significant relationship between NEQ and BMI. Similarly, among university students in the United States, Saudi Arabia, and Malaysia, there was no significant association between NES and BMI (Runfola et al. 2014);(Ahmed et al. 2019);(Gan et al. 2019);(Dzulkafli et al., 2020). This was also observed in women in the United States (Rogers et al. 2006). Higher BMI, on the other hand, was associated with NES among Saudi university students (Ahmad et al. 2019). Furthermore, particular populations such as depressed patients (Kucukgoncu et al. 2014) and obese adults with metabolic syndrome showed a significant association between NES and BMI (Ali et al. 2020).

It has been claimed that NES may play a role in obesity development, however this has yet to be proved (Shoar et al. 2019). Because it entails excessive calorie eating at night, NES might be considered a risk factor for obesity and an increase in BMI. Furthermore, it has

Table 3 Relationship between NEQ and participants' socio-demographics and lifestyle

Variable		NEQ		*p*-value
		Yes (%)	No (%)	
Gender	Male	76.1	23.9	0.119
	Female	84.2	15.8	
Marital Status	Single	81.7	18.3	0.323
	Married	92.9	7.1	
	Other	80	20	
Area of Living	City	83.2	16.8	0.753
	Villages and camps	81.9	18.1	
Type of housing	With parents	82.3	17.7	0.267
	With relatives	75	25	
	Student housing	83.3	16.7	
	With spouse	92.6	7.4	
	Other	57.1	42.9	
Faculty	Agricultural & veterinary Medicine	81.7	18.3	0.866
	Arts	86.7	13.3	
	Economy & social sciences	85.3	14.7	
	Education	80	20	
	Engineering & IT	73.7	26.3	
	Graduate studies	78.6	21.4	
	Human sciences	94.1	5.9	
	Law	83.3	16.7	
	Medicine & health sciences	81.7	18.3	
	Physical education	66.7	33.3	
	Religion	100	0	
	Applied sciences	84.6	15.4	
	Other	94.1	5.9	
Academic year	1st	82	18	0.115
	2nd	78.9	21.1	
	3rd	83.1	16.9	
	4th	77.4	22.6	
	Other	94.4	5.6	
Family income	< 1500 NIS	84	16	0.361
	1500–3000 NIS	83.3	16.7	
	3000–5000 NIS	86.9	13.1	
	More than 5000 NIS	77.6	22.4	
Study Funding	Family	83	17	0.970
	Scholarship	80	20	
	Personal income	80	20	
	Other	81.3	18.8	
Chronic disease	Yes	100	0	0.091
	No	81.9	18.1	
Surgery	Yes	83.3	82.4	0.857
	No	16.7	17.6	
Medication	Yes	91.7	8.3	0.223
	No	81.9	18.1	
Smoking	Non-smoker	78.3	21.7	0.474
	Irregular smoker	88.6	11.4	
	Regular smoker	82	18	
Reported type of smoking	Cigarette	75	25	0.163
	Pipe (shisha)	88.9	11.1	
Diet	Yes	85.3	14.7	0.254
	No	80.5	19.5	
Reason of diet	Weight loss/gain	86.2	13.8	0.150

Table 3 (continued)

Variable		NEQ		*p*-value
		Yes (%)	No (%)	
	Therapeutic diet	100	0	
	Other	66.7	33.3	
Losing/gaining weight	Yes	85.7	14.3	0.209
	No	95.5	4.5	
Diet satisfaction	Yes	83	17	0.089
	No	94.4	5.6	
Diet for other reason satisfaction	Yes	83.3	16.7	0.072
	No	100	0	
Working out	Yes	84.6	15.4	0.468
	No	81.4	18.6	
Walk	Yes	82.4	17.6	0.920
	No	82.8	17.2	
BMI	Underweight	80.6	19.4	0.924
	Normal	81.8	18.2	
	Overweight	84.2	15.8	
	Obese	84.4	15.6	

*significant at $p<.05$ using Chi square test

Table 4 Association between NES and participants' characteristics

Variable	NEQ	
	Correlation Coefficient	*p*-value
Age	0.023	0.673
Walking times/week	−0.185*	0.018
Walking time (min)	0.055	0.487
Screen hours (study)	−0.071	0.220
Screen hours (Fun)	0.101	0.078
BMI	0.021	0.707

*Correlation was significant at the 0.05 (2-tailed)

Table 5 Relationships between NES and sleep quality subscales

PSQI subscale	NES		*p*-value
	Yes	No	
Subjective sleep quality	1.20 ± 0.96	0.76 ± 0.76	0.000**
Sleep latency	1.58 ± 1.03	1.02 ± 1.02	0.000**
Sleep duration	0.77 ± 1.03	0.59 ± 0.96	0.210
Habitual sleep efficiency	0.69 ± 1.06	0.50 ± 0.90	0.167
Use of sleep medications	0.27 ± 0.69	0.26 ± 0.74	0.946

*$p<05$, using independent samples t-test

**$p<01$, using independent samples t-test

Table 6 Correlations between NEQ and sleep quality subscales

Variable	NEQ	
	Correlation Coefficient	*p*-value
Subjective sleep quality	0.321**	0.000
Sleep latency	0.304**	0.000
Sleep duration	0.140*	0.011
Habitual sleep efficiency	0.078	0.157
Use of sleep medications	0.067	0.224
Daytime dysfunction	0.145**	0.008

*Correlation was significant at the 0.05 (2-tailed)

**Correlation was significant at the 0.01 (2-tailed)

been discovered that NES is more common and linked to weight gain among obese adults (Muscatello et al. 2022). However, the literature on the link between NES and BMI is inconsistent (Shoar et al. 2019);(Kaur et al. 2021);(Muscatello et al. 2022). The conflicting results regarding the link between NES and BMI are most likely owing to differences in measuring methodologies as well as the involvement of several moderators such as age, socioeconomic status, and others that were not systematically researched in available studies (Bruzas and Allison 2019). Obesity is also a complicated and multifaceted condition in which genetic, behavioral, environmental, and socioeconomic variables all play a role (Hruby and Hu 2015). As a result, more research into the link between BMI and NES should be done.

NES and sleep quality

In this study, NES was significantly related to higher scores of subjective sleep quality ($p<.01$), sleep latency ($p<.01$), and daytime dysfunction ($p<.05$). Additionally, NEQ scores were significantly correlated with these scores in addition to sleep duration ($p<.05$) score. In multiple linear regression, subjective sleep quality ($p<.01$) and sleep latency ($p<.01$) predicted NEQ score.

Similarly, among Malaysian university students, poor sleep quality was linked to NES (Gan et al. 2019). People with NES reported greater subjective sleep disturbances, such as short sleep, poor sleep quality, and difficulties falling asleep, than their non-NES counterparts, according to a study conducted in the United States (Birketvedt et al. 1999). Likewise, American women with NES reported more sleep disturbances than women without NES, including worse sleep quality, shorter sleep

duration, and more awakenings. Furthermore, NES in women was linked to decreased total sleep time and sleep efficiency when their sleep patterns were compared using polysomnography (PSG) (Rogers et al. 2006). In an Egyptian study, the NEQ was found to have a statistically significant positive connection with sleep latency and minutes spent awake in obese patients with metabolic syndrome (Ali et al. 2020).

In our research, neither habitual sleep efficiency nor the usages of sleep medicine subscale scores were shown to be significantly linked with NEQ. NEQ was found to be significantly associated with all PSQI subscale scores in a UK study (Cleator et al. 2013). The link between NES and sleep disruption is unquestionably complicated. Aside from the psychological aspects outlined above, it's possible that sleep deprivation-induced metabolic changes have a role in the occurrence of NES. Alterations in glucose regulation and appetite neuroendocrine control are two of the negative impacts of prolonged partial sleep loss (Knutson et al. 2007).

Strengths and limitation

Within a representative sample of Palestinian university students, this study was successful in establishing the prevalence of NES and the relationship between it and socio-demographics, lifestyle, and sleep quality. The study is a cross-sectional study, examining only the relationship, not cause and effect. There is a possibility that the COVID-19 pandemic influenced the results, and we do not have any previous data to compare them with.

Conclusion

The presence of NES was identified in 82.6% of the study subjects. No indication of a connection between NES and BMI categories or scores could be found in our study population. In addition, there was no statistically significant association between NEQ and body mass index (BMI). Additionally, no sociodemographic or lifestyle component was found to be statistically significant in relation to NES. The presence of NES was found to be associated with higher scores on subjective sleep quality ($p<.01$), sleep latency ($p<.01$), and daytime dysfunction ($p<.05$) measures. Additional to this, the NEQ scores were shown to be substantially connected with these scores, as well as the sleep duration scores ($p<.05$). Subjective sleep quality ($p<.01$) and sleep latency ($p<.01$) were found to be significant predictors of the NEQ score in multiple linear regression.

Abbreviations

BDI	Beck Depression Inventory
BMI	Body Mass Index
COVID_19	Coronavirus Disease Of 2019
DSM_5	Diagnostic and Statistical Manual of Mental Disorders, Fifth edition
EAT	26–Eating Attitude Test–26
NEQ	Night Eating Questionnaire
NES	Night Eating Syndrome
PSG	Polysomnography
PSQI	Pittsburgh Sleep Quality Index
SPSS	Statistical Package for Social Sciences
SRED	Sleep Related Eating Disorder

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Author contributions

Manal Badraswi principle investigator, Samar Jallad and Reem Abu Alwafa draft finalized data analysis and draft the first manuscript, Razan Abu Al-Sheikh and Raghad Adwan ride proposal, data collection and primely analysis.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

An-Najah National University's Institutional Review Board approved this study (Int July 2021/6). The questioning began with an informed written consent. Participants signed the consent form. No reward or promotion was given. The research methodologies employed were compliant with legislation. All data were kept private and solely used for study.

Consent for publication

All authors agree to publish this paper.

Competing interests

The authors declare no competing interests.

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References

Ahmad M, Kashoo FZ, Alqahtani M, Waqas S, Rizvi M, Bushra A. Relation between night eating syndrome and academic grades among university students. Turkish J Endocrinol Metabolism. 2019;23(2):85.

Ahmed S, Harbi A, Saeed FSA, O., Ali SI. Prevalence of night eating syndrome amongst medical students in Saudi Arabia. Population. 2019;21:24.

Ali YAM, Abbas NE, Mousa AAH, Abdelbaky A, Bahammam AS, Zaki NFW. Impact of social jetlag and circadian patterns on patients with metabolic and nocturnal eating syndromes. Chronobiology Med. 2020;2(4):175–83.

Allison KC, Lundgren JD, O'Reardon JP, Martino NS, Sarwer DB, Wadden TA, Crosby RD, Engel SG, Stunkard AJ. The night eating questionnaire (NEQ): psychometric properties of a measure of severity of the night eating syndrome. Eat Behav. 2008;9(1):62–72.

Association AP. Diagnostic and statistical manual of mental disorders (DSM-5®). American Psychiatric Pub; 2013.

Birketvedt GS, Florholmen J, Sundsfjord J, Østerud B, Dinges D, Bilker W, Stunkard A. Behavioral and neuroendocrine characteristics of the night-eating syndrome. JAMA. 1999;282(7):657–63.

Borges KM, dos Santos Figueiredo FW, do Souto RP. Night eating syndrome and emotional states in university students. J Hum Growth Dev. 2017;27(3):332–41.

Bruzas MB, Allison KC. A review of the relationship between night eating syndrome and body mass index. Curr Obes Rep. 2019;8(2):145–55.

Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193–213.

Cheikh Ismail, Leila TM, Osaili MN, Mohamad AA, Marzouqi, Amjad H, Jarrar, Dima O, Abu Jamous E, Magriplis, Habiba I, Ali HA, Sabbah H, Hasan et al. Eating habits and lifestyle during COVID-19 lockdown in the United Arab Emirates:

a cross-sectional study. Nutrients. 2020;12(11):3314. https://doi.org/10.3390/nu12113314
Chow HY. The association between psychological distress, sleep quality, and night eating syndrome (NES) among undergraduates in University Tunku Abdul Rahman (UTAR), Kampar campus. Final Year Project, UTAR; 2023.
Cleator J, Abbott J, Judd P, Wilding JP, Sutton CJ. Correlations between night eating, sleep quality, and excessive daytime sleepiness in a severely obese UK population. Sleep Med. 2013;14(11):1151–6.
Da Silva FR, Junior AHL, Brant VM, Lôbo ILB, Lancha LOP, Silva A, de Mello MT. The effects of COVID-19 quarantine on eating and sleeping behaviors. Nutrire. 2020;45(2):1–4.
Dzulkafli NH, Hamirudin AH, Sidek S. Night eating syndrome and its association with body mass index among female university students. Int J Allied Health Sci. 2020;4(4):1626–34.
Gan WY, Chin PQ, Law LS. Determination of risk factors for night eating syndrome among public university students in Malaysia. Malaysian J Med Health Sci. 2019;15:25–32.
Guo F, Tian Y, Cui Y, Huang C. Night-eating syndrome and depressive symptoms in college freshmen: fitness improvement tactics in youths (FITYou) project. Psychol Res Behav Manag. 2020;13:185–91. https://doi.org/10.2147/PRBM.S234025
Hruby A, Hu FB. The epidemiology of obesity: a big picture. PharmacoEconomics. 2015;33(7):673–89.
Kaur J, Dang AB, Gan J, An Z, Krug I. Night eating syndrome in patients with obesity and binge eating disorder: a systematic review. Front Psychol. 2021;12:766827–766827.
Knutson KL, Spiegel K, Penev P, Van Cauter E. The metabolic consequences of sleep deprivation. Sleep Med Rev. 2007;11(3):163–78.
Krystal AD, Edinger JD. Measuring sleep quality. Sleep Med. 2008;9:S10–7.
Kucukgoncu S, Tek C, Bestepe E, Musket C, Guloksuz S. Clinical features of night eating syndrome among depressed patients. Eur Eat Disorders Rev. 2014;22(2):102–8.
Mohammad Miraj F, Kashoo S, Saleem M, Alzhrani A, Alanazi H, Alzahrani MA, Shaphe M, Ahmad F, Ahmad AR, Shaik. Ahmed Almansour, Mohamed Sherif Sirajudeen, Shady Abdullah Alshewaier, Mazen Alqahtani, Shabir Ahmad Mir, Mohammad Siddiq, Danah Alyahya, Riyaz Ahamed Shaik. Prevalence of night eating syndrome associated with psychological disorders among university students: a metaanalysis, Journal of King Saud University - Science. 2022;34(5):102031, ISSN 1018–3647. https://doi.org/10.1016/j.jksus.2022.102031
Muscatello MR, Torre G, Celebre L, Dell'Osso B, Mento C, Zoccali RA, Bruno A. In the night kitchen: A scoping review on the night eating syndrome. Australian & New Zealand Journal of Psychiatry. 2022 Feb;56(2):120–36.
Night Eating Syndrome (NES). 2021. Retrieved 13 February from https://my.clevelandclinic.org/health/diseases/21731-night-eating-syndrome-nes
Nolan LJ, Geliebter A. Night eating is associated with emotional and external eating in college students. Eat Behav. 2012;13(3):202–6.
Ramalho SM, Trovisqueira A, de Lourdes M, Gonçalves S, Ribeiro I, Vaz AR, Machado PP, Conceição E. The impact of COVID-19 lockdown on disordered eating behaviors: the mediation role of psychological distress. Eat Weight Disorders-Studies Anorexia Bulimia Obes. 2021:1–10.
Riccobono G, Iannitelli A, Pompili A, Iorio C, Stratta P, Rossi R, Bersani G, Pacitti F. Night eating syndrome, circadian rhythms and seasonality: a study in a population of Italian university students. Riv Psichiatr. 2020;55(1):47–52, https://doi.org/10.1708/3301.32719, PMID: 32051626.
Rogers NL, Dinges DF, Allison KC, Maislin G, Martino N, O'Reardon JP, Stunkard AJ. Assessment of sleep in women with night eating syndrome. Sleep. 2006;29(6):814–9.
Runfola CD, Allison KC, Hardy KK, Lock J, Peebles R. Prevalence and clinical significance of night eating syndrome in university students. J Adolesc Health. 2014;55(1):41–8.
Sakthivel S, Janani P, Hay, Mannan H. A scoping review on the association between night eating syndrome and physical health, health-related quality of life, sleep and weight status in adults nutrients. 2023;15(12):2791. https://doi.org/10.3390/nu15122791
Sara Haneef & Sarah Almuammar. Prevalence and associations of night eating syndrome among medical students in Saudi Arabia. Psychol Res Behav Manage. 2024;17:529–35. https://doi.org/10.2147/PRBM.S450463
Shoar S, Naderan M, Mahmoodzadeh H, Shoar N, Lotfi D. Night eating syndrome: a psychiatric disease, a sleep disorder, a delayed circadian eating rhythm, and/or a metabolic condition? Expert Rev Endocrinology Metabolism. 2019;14(5):351–8.
Stunkard AJ, Grace WJ, Wolff HG. The night-eating syndrome. A pattern of food intake among certain obese patients. Am J Med. 1955;19:78–86.
Suna G, Ayaz A. Is poor sleep quality related to disordered eating behavior and mental health among university students? Sleep Biol Rhythms. 2022;20:345–52. https://doi.org/10.1007/s41105-022-00374-9
Turgut M, Soylu Y, Metin SN. Physical activity, night eating, and mood state profiles of athletes during the COVID-19 pandemic. Progress Nutr. 2020;22(2–S):e2020019.
Vander Wal JS. Night eating syndrome: a critical review of the literature. Clin Psychol Rev. 2012;32(1):49–59.
Vinai P, Ferri R, Ferini-Strambi L, Cardetti S, Anelli M, Vallauri P, Ferrato N, Zucconi M, Carpegna G, Manconi M. Defining the borders between sleep-related eating disorder and night eating syndrome. Sleep Med. 2012;13(6):686–90.
Zadjali F, Al-Bulushi A, AlHassani F, Al Hinai M. Proportion of night eating syndrome in arab population of Oman. J Eat Disorders. 2015;3(1):1–2.

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