Prevalence of Night Eating Syndrome among Obese Patients Attending Primary Health Care Settings in Port Said Governorate, Egypt

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Abstract:

Background: Night-eating syndrome (NES) is a common type of eating disorder in obese patients. This study was motivated by the paucity of studies on the prevalence and associated factors of NES among primary care patients with obesity in Egypt. **Objectives:** To assess the prevalence and the associated factors of NES among obese adults attending primary health care (PHC) settings in the Port Said governorate. **Methods:** A cross-sectional study included 386 adult obese patients from 5 PHC settings in the Port Said governorate affiliated with the General Authority of Healthcare. The data was collected from November 2020 to March 2021. Demographic characteristics, disease profile, and measurement were collected in addition to the Arabic versions of the following tools: the Night Eating Syndrome Questionnaire (NEQ), the Patient Health Questionnaire 4 (PHQ-4), and the Insomnia Severity Index (ISI). **Results:** Symptoms of NES were presented among 22.02% of the participants, using a cut-off point ≥25 of the NES questionnaire. Symptoms of NES were associated with psychological distress symptoms (OR 2.85, p=0.001), high level of education (OR 2.33, p=0.046), insomnia symptoms (OR 2.22, p=0.017), and physical inactivity (OR 2.18, p=0.005). Symptoms of NES were not associated with other demographic factors, smoking, body mass index (BMI), waist circumference, or comorbidities. **Conclusion:** Symptoms of NES are prevalent among obese PHC patients with psychological distress, high education, insomnia, and sedentary lifestyle. Assessment of NES is needed during the caring for obese PHC patients.

Keywords: Eating disorder, Obesity, Psychological distress

Introduction:

Obesity is a very common chronic disease in the world. [1] In Egypt, the prevalence rate of obesity in adults was 35.7%, according to Stepwise Approach to Surveillance (STEPS) survey in 2017.[2] Obesity is the result of endogenous factors such as genetic factors and exogenous factors as some eating disorders.[1] Night eating syndrome is a common type of eating disorder among obese patients. The NES is characterized by recurrent episodes of night eating in the evening (after dinnertime) or eating after awakening from sleep. Also, it is characterized by at least 3 of the following symptoms: morning anorexia, presence of a strong urge to eat between dinner and sleep and/or during the night, insomnia, frequently depressed mood and a belief that one cannot get back to sleep without eating.[3] Early studies comparing healthy weight controls and severely obese people indicated that,

prevalence ranging between 0.5–1.5% and 15–25%, respectively. Later studies in obese patients estimate prevalence between 8.9–14%.[4]

The primary care provider should be aware about the presence of nocturnal eating warrant a diagnosis of NES. Primary care physicians should assess NES in obese patients and in those presenting for weight management.[5] In the light of the burden of obesity and NES, the association between obesity and NES, the importance of the detection of NES in primary care, and the limited studies on the magnitude of NES in Egypt, this study was carried out to evaluate the prevalence and associated factors of NES among obese patients attending PHC settings in Port Said governorate.

Methods:

Design, setting and sampling: This cross-sectional study was conducted in 5 PHC settings in Port Said governorate, affiliated with the General Authority of Healthcare from November 2020 to March 2021. A convenience sampling technique was used to collect data from all obese adult patients (body mass index [BMI] ≥30). Exclusion criteria were pregnant and lactating women, all patients working night shift since it is known that shift work can cause a redistribution of food intake from day to night, those patients known to be terminally

ill, and individuals with severe mental disorders. It was planned to take a sample large enough to demonstrate 51% prevalence of NES among obese adults,[4] we used the following formula: $n = [Z_{\alpha/2}/E]^2 * P (1-P)$,[6] n = sample size, $Z_{\alpha/2} = 1.96$ (The critical value that divides the central 95% of the Z distribution from the 5% in the tail), P = Prevalence/proportion of NES in obese patients = 51%,[4] E = Margin of error/Width of confidence interval = 5%. So, by calculation, the sample size is 386 subjects.

Study tools:

Each participant was assessed by a semi-structured questionnaire, which consists of 5 parts: demographic data, disease profile, and measurement, the Arabic versions of the NEQ, PHQ-4, and ISI.[7-11] Demographic data and disease profile included age, gender, marital status, educational level, employment status, income, attempt to reduce body weight, co-morbidities, family history of obesity and smoking status. All participants had their anthropometric measurements are taken, including their body weight (kg), height (in cm), BMI, and waist circumference.

The NEQ is a valid, and reliable tool for determining the severity of NES in adults. It consists of 15 questions, with each item being graded on a scale of 0-4. Item 13 is not included in the total score, and used to

distinguish NES from sleep-related eating disorders. Item 15 is used as a descriptor and is not factored into the overall score. The NEQ total score ranges from 0 to 52, with a cut point of 25 or more.[7] The Arabic version of the NEQ demonstrated sound validity and reliability, Cronbach's alpha was 0.54.[8]

The PHQ-4 is a valid and reliable tool for detecting both depressive and anxiety disorders in PHC settings. It consists of a 2-item Patient Health Questionnaire (PHQ-2) for depression, and a 2-item Generalized Anxiety Disorders scale (GAD-2) for anxiety. The PHQ–4 scores were categorized as normal (0–2), mild (3–5), moderate (6–8), and severe (9–12). Psychological distress is indicated by a cut-off value ≥6. Cronbach's alpha of the PHQ-4 scale was 0.85.[9] The Arabic version of the PHQ-4 is a valid and reliable tool. Internal consistency was good. Cronbach's alpha of the PHQ-2 was 0.76, while Cronbach's alpha of the GAD-2 was 0.83.[10]

The ISI is a short tool that assesses insomnia. The ISI consists of seven items, with total score ranging from 0 to 28,[11] a cutoff score of ≥ 14 is optimal in PHC with 82.4% sensitivity, and 82.1% specificity for detecting clinical insomnia.[12] The Arabic version of the ISI scale has shown to be a valid and reliable tool, internal consistency reliability was 0.84.[11]

Data management:

The Statistical Package for the Social Sciences (SPSS V25.0) was used to perform all data management and analyses. A significance level of 0.05 was used in all statistical analyses. All categorical variables were summarized as frequencies and percentages (%). The distributions of continuous variables were tested for normality with the Shapiro-Wilk test. The median and interquartile ranges were used for the not-normally distribution variables. The chi-squared or Fisher exact tests as appropriate were used to compare categorical data. Mann-Whitney test was used to compare quantitative data with dichotomous variables. Spearman's Rank-Order Correlation (rho) was used to assess the correlation of NEQ total score with total scores of the PHQ-4 (distress), PHQ-2 (depression), GAD-2 (anxiety), and ISI (insomnia). Bivalent regression analysis was used to assess the predictors of NES.

Ethical consideration:

The study was approved by the Research Ethics Committee of the Faculty of Medicine, Suez Canal University (Ref No. 4098/2020, dated 23-2-2020). Relevant authorities were contacted for permission to conduct the study in PHC settings affiliated with the General Authority of Healthcare in Port Said governorate. Informed consent was obtained from all participants.

Results:

The current study included 386 participants. The mean age of the patients was 43.17 ± 12.32 years and 38.3% of the sample were housewives or unemployed. The most frequent educational levels were high education (34.2%) and intermediate education (27.5%). About 16.8% of the patients perceive their income as unsatisfactory. More than half of (51.6%) the patients had attempted weight reduction trials, 44% of them were following a diet regimen to lose weight, and 45.6 % of those participants were practicing exercise. The prevalence of NES among our sample was 22.02%.

Table (1) demonstrates that NES was not associated with socio-demographic factors except educational level (p=0.04). Table (2) shows that NES were significantly associated with physical inactivity (p=0.008) and smoking (p=0.049). Table (3) shows that night eating symptoms were significantly associated with psychological distress, anxiety, depression, and insomnia symptoms (p<0.05). Logistic regression analysis reveals that the predictors of the night eating symptoms were psychological distress symptoms (OR 2.85, p=0.001), high level of education (OR 2.33, p=0.046), insomnia symptoms (OR 2.22, p=0.017), and physical inactivity (OR 2.18, p=0.005) as shown in Table 4.

Discussion:

The current study was the first study to evaluate the prevalence and associated factors of NES among obese patients in PHC settings in Egypt. This study found that one out of five participants had NES, NES were associated with psychological distress, high level of education, insomnia, and physical inactivity.

The surprising NES prevalence in this study may be related to the increased psychological distress after the COVID-19 pandemic and the selection of obese patients in the current study. This finding was similar to previous studies conducted on postoperative obesity surgery patients, authors revealed that the prevalence estimates were 26% and 27%.[11,13] In contrast to other studies, the present study's finding is higher than the prevalence of NES in previous studies, which ranged across countries from 1.1% to 15%.[14-19,13] This may be related to differences in race, culture and study population e.g. general population, university students, university staff, women, and twins. However, previous old studies found that the prevalence rates of NES among obese persons seeking weight loss surgery were higher than the prevalence rate in the current study, these estimates ranged from 43.4% to 64%.[7] The provided care for obesity in current Egypt's health

system should be designed to be more effective and efficient in the detection and management of NES.

In the present study, NES among obese participants was not associated with any socio-demographic factors. This is in keeping with a result of a German study on the general population.[20] Also, this finding was consistent with several studies in Turkey.[21,22] In an American study, Yahia et al found no association between smoking and NES.[16] In another study in Saudi Arabia, there was no significant difference in the rates of NES concerning to gender.[18] This finding was in line with a German study.[23]

In contrast to our findings regarding the socio-demographic associations, a study in Sweden found an association between age and NES.[24] In turkey, Orhan *et al* found a significant association between gender and NES,[25] this was confirmed by another study in China.[26] In the present study NES were significantly associated with a higher level of education and physical inactivity, which is in disagreement with many studies.[20, 16]

The current study found significant positive correlations between NES with insomnia, psychological distress including anxiety and depression symptoms. Further randomized control trials are needed to assess the relationship of NES with psychological distress, and insomnia. An association between depression and NES has been reported in numerous studies in different samples, Sevincer *et al* reported that depression was identified in 55% of NES group, Also, Calugi *et al* discovered a strong correlation between NES and depression scores in patients with obesity classes II and III.[14]

In agreement with our results, Allison *et al* revealed a positive association between NES and depressive symptoms.[27] That was in line with a study done by O'Reardon.[4] Several studies in US had proven the correlation of NES and depressive symptoms.[15,4,28] de Zwaan *et al* found that depression was a predictor for NES among the German general population, Küçükgöncü *et al* and Orhan *et al* revealed the relationship between NES and depression in Turkish patients.[25] the results were in deal with a study in Norway, and a Chinese study.[26,4] In contrast to the present study, a study in Germany, revealed no association between NES and depression.[23]

In the present study, anxiety symptom rates were significantly higher among participants who had NES, like previous studies screened anxiety among NES, Sevincer *et al* discovered that people with NES had considerably greater rates of anxiety symptoms.[14] In another study, night

eaters were found to be more prone to lifetime anxiety disorders (47.4%) when compared with healthy controls (9.1%) with a positive correlation.[25] Among diabetic patients in the United States, the anxiety was a predictor for developing NES,[29] similar results were obtained by Allison *et al.*[27] A strong link between NES and anxiety was discovered by de Zwaan *et al* in their studies on German general population, [20] that was confirmed by a study Olbrich *et al.*[23] In contrast to our findings, Moize *et al* were unable to find any correlation between Anxiety and NEQ scores.[14]

In the current study, insomnia rates were significantly higher among participants who had NES, like the previous studies, A Swedish study discovered that people with NES had sleeping problems. Also, in a study in England, it was found that the total night eating score is weakly correlated with sleep duration and strongly correlated with sleep disorders.[30] In contrast to our findings, in China Guo *et al* were unable to find any correlation between sleep disorders and NEQ scores.[26]

Study limitations:

The study has several limitations. The cross-sectional study design used to collect data also makes it difficult to demonstrate cause-and-effect relationships. There were limited studies for sound comparison in Egypt, and the present study was conducted in only urban areas with lack of randomization and hence its results cannot be generalized for the entire population of Egypt

Conclusion:

Symptoms of the NES were prevalent in obese adult patients attending PHC settings in Port Said governorate. These symptoms were significantly present among patients who were distressed, highly educated, had insomnia symptoms, and were physically inactive. Assessment of NES is recommended when caring for obese adults in PHC settings.

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Table (1): Association of night eating syndrome symptoms with socio-demographic characteristics among the study participants

Variables	All participants (n=386)	Night Eating Syndrome Symptoms		Test value	p-value
		Absent (n=301)	Present (n=85)		
Age (years)					
▪ <35 years	113 (29.3%)	82 (27.2%)	31 (36.5%)	4.668	0.198
▪ 35-44 years	90 (23.3%)	72 (23.9%)	18 (21.2%)		
▪ 45-54 years	92 (23.8%)	70 (23.3%)	22 (25.9%)		
▪ 55-64 years	91 (23.6%)	77 (25.6%)	14 (16.5%)		
Gender					
▪ Male	172 (44.6%)	133(44.2%)	39 (45.9%)	0.077	0.781
▪ Female	214 (55.6%)	168(55.9%)	46 (54.1%)		
Occupation					
▪ Non-worker or housewife	148 (38.3%)	118(39.2%)	30 (35.3%)	3.271	0.352
▪ Skilled/Unskilled manual worker	33 (8.5%)	29 (9.8%)	4 (4.7%)		
▪ Trades	23 (6.0%)	18 (6.0%)	5 (5.9%)		
▪ Semi-professional/professional	181 (47.1%)	136(45.2%)	46 (54.4%)		
Marital status					
▪ Single	49 (12.7%)	35 (11.6%)	14 (16.5%)	3.203	0.361
▪ Married	265 (68.7%)	205(68.1%)	60 (70.6%)		
▪ Divorced	34 (8.8%)	29 (9.6%)	5 (5.9%)		
▪ Widow	38 (9.8%)	32 (10.6%)	6 (7.1%)		
Educational level					
▪ Illiterate	35 (9.1%)	29 (9.6%)	6 (7.1%)	19.739	0.003[*]
▪ Read and write	18 (4.7%)	14 (4.7%)	4 (4.7%)		
▪ Primary education	30 (7.8%)	26 (8.6%)	4 (4.7%)		
▪ Preparatory education	57 (14.8%)	41 (13.6%)	16 (18.8%)		
▪ Intermediate education	106 (27.5%)	90 (29.9%)	16 (18.8%)		
▪ High education	132 (34.2%)	99 (32.9%)	33 (38.8%)		
▪ Post graduate education	8 (2.1%)	2 (0.7%)	6 (7.1%)		
Income					
▪ Not enough	65 (16.8%)	54 (17.9%)	11 (12.9%)	1.377	0.711
▪ Hardly enough	150 (38.9%)	117(38.9%)	33 (38.8%)		
▪ Enough for ordinary & emergent needs	124 (32.1%)	94 (31.2%)	30 (35.3%)		
▪ More than enough	47 (12.2%)	36 (11.9%)	11 (12.9%)		

P-values are based on Chi-Square test. Statistical significance at P < 0.0

Table (2): Association of night eating syndrome symptoms with disease characteristics among the study participants

Variables	All participants (n=386)	Night Eating Syndrome Symptoms		Test value	p-value
		Absent (n=301)	Present (n= 85)		
BMI					
▪ Class 1	223 (57.8%)	173(57.48%)	50 (58.82%)	2.630	0.268[a]
▪ Class II	97 (25.1%)	72 (23.92%)	25 (29.41%)		
▪ Class III	66 (17.1%)	56 (18.60%)	10 (11.76%)		
Waist circumference, MED (IQR)					
▪ Male	111.65 (10.48)	110 (104-115)	112 (103-117)	2455.50	0.613[b]
▪ Female	111 (104-106)	110 (103-124)	109 (101-118)	3497	0.324[b]
Weight reduction trials					
▪ Present	199 (51.6%)	151 (50.2%)	48 (56.5%)	1.055	0.304[a]
▪ Absent	187 (48.4%)	150 (49.8%)	37 (43.5%)		
Following diet regimen					
▪ Present	170 (44.0%)	135 (44.9%)	35 (41.2%)	0.363	0.547[a]
▪ Absent	216 (56.0%)	166 (55.1%)	50 (58.8%)		
Regular physical activity					
▪ Active	176 (45.6%)	148 (49.2%)	28 (32.9%)	7.037	0.008[a]
▪ Inactive	210 (54.4%)	153 (50.8%)	57 (67.1%)		
Smoking					
▪ Present	5 (1.3%)	100 (33.2%)	27 (31.8%)	6.052	0.049[a]
▪ Absent/ex-smoker	381 (98.4%)	201 (60.5%)	58 (68.2%)		
Bariatric surgery					
▪ Present	11 (2.8%)	7 (2.3%)	4 (4.7%)	1.356	0.268[c]
▪ Absent	375 (97.2%)	294 (97.7%)	81 (95.3%)		
Family history of obesity					
▪ Present	127 (32.9%)	208 (69.1%)	56 (65.9%)	0.318	0.573[a]
▪ Absent	259 (67.1%)	93 (30.9%)	29 (34.1%)		

Table 3. Association of night eating syndrome symptoms with psychological distress, anxiety, depressive, and insomnia symptoms among the study participants

Variables	Night Eating Syndrome Symptoms		Test value	p-value
	Absent (n=301)	Present (n= 85)		
PHQ-4				
▪ Non psychological distress	143 (47.5%)	20 (23.5%)	23.825	< 0.001*
▪ Mild psychological distress	115 (38.2%)	36 (42.4%)		
▪ Moderate psychological distress	33 (10.9%)	24 (28.2%)		
▪ Severe psychological distress	10 (3.3%)	5 (5.9%)		
GAD-2				
▪ Positive score	50 (16.6%)	27 (31.8%)	9.531	0.002*
▪ Negative score	251 (83.4%)	58 (68.2%)		
PHQ-2				
▪ Positive score	55 (18.3%)	31 (36.5%)	12.677	< 0.001*
▪ Negative score	246 (81.7%)	54 (63.5%)		
Insomnia severity index				
▪ ISI positive score	37 (12.29%)	24 (28.24%)	12.662	< 0.001*
▪ ISI negative score	264 (87.71%)	61 (71.76%)		

GAD-2, 2-item Generalized Anxiety disorder; ISI, Insomnia Severity Index; PHQ-2, 2-item Patient Health Questionnaire; PHQ-4, Patient Health Questionnaire 4.
p-values are based on Chi-Square test.
* Statistical significance at $P < 0.05$

Table (4): Logistic regression analysis for predicting night eating syndrome symptoms in the study participants

Predictors	B	S.E.	P-value	OR	95% C.I.	
					Lower	Upper
Psychological distress (moderate/severe vs. non/mild)	1.048	0.319	0.001*	2.851	1.525	5.330
Insomnia symptoms (Present vs. absent)	0.799	0.336	0.017*	2.223	1.151	4.293
Physical activity (Inactive vs. active)	-0.777	0.279	0.005*	2.175	1.260	3.756
Smoking (Smoker vs. non-smoker/ex-smoker)	0.062	0.286	0.827	1.064	0.607	1.866
Education (vs. Illiterate/read and write)						
Primary/preparatory education	0.360	0.457	0.431	1.434	0.585	3.512
Intermediate education	-0.263	0.473	0.579	0.769	0.304	1.945
High education/Postgraduate education	0.847	0.425	0.046*	2.333	1.014	5.366

Binary logistic regression model: Omnibus Tests for Model fit ($p < 0.001$), Hosmer and Lemeshow χ^2 (df) = 13.653, p = 0.058; Negelkerke R Square = 0.145; Overall correct classification =79%

Dependent Variable: (NES positive score); OR: Odds ratio, CI: Confidence interval

Variables entered in step 1; Psychological distress (moderate/severe vs. non/mild), Insomnia symptoms (Present vs. Absent), Physical activity (Inactive vs. Active), Smoking (Smoker vs. non-smoker/ex-smoker), Education (vs. Illiterate/read and write)

* Statistical significance at $P < 0.05$

الملخص العربي

معدل انتشار متلازمة الأكل ليلاً بين مرضى السمنة المترددين على منشآت الرعاية الصحية الأولية في محافظة بورسعيد ـ مصر

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الخلفية: تعد السمنة واحده من المشاكل المتزايدة عالميا وتعد متلازمة الأكل ليلا أكثر أنواع إضطرابات الأكل إنتشارا بين مرضى السمنة. **الاهداف:** تم تنفيذ هذه الدراسة لقياس معدل إنتشار متلازمة الأكل ليلا وكذلك إيضا معرفة العوامل المصاحبة للمتلازمة في مرضى السمنة المترددين علي منشآت الرعاية الأولية بمحافظة بورسعيد. **طرق البحث:** تم إجراء دراسة مقطعية على ٣٨٦ مريض سمنة من المرضى المترددين على خمس وحدات حيث تم إختيار عينة عشوائية متعددة المراحل بمحافظة بورسعيد. وكانت كتلة الجسم لهم أكثر من أو تساوي ٣٠ ولا يعانون من ضعف ادراكي أو مشاكل عقلية شديدة أو ضعف بالبصر والسمع. وسيستبعد الحوامل والعاملون بالدوام الليلي وكذلك الذين عندهم مضاعفات شديدة من الأمراض المختلفة. تم التقييم من خلال إستمارة لكل مشارك بالبحث تتضمن البيانات الشخصية للمشارك ومقياس المستوى الأجتماعي والأقتصادي للأسرة والتاريخ المرتبط بمرض السمنة والقياسات واستبيان متلازمة الأكل أثناء الليل و استبيان صحة المريض ٤ ومؤشر شدة الارق وكما تم الحصول على بعض القياسات كالطول والوزن وكتلة الجسم ومحيط الخصر. **النتائج:** كان معدل إنتشار متلازمة الأكل ليلا في مرضى السمنة المترددين علي وحدات الرعاية الولية بمحافظة بورسعيد كان (٢٢٬٠٢%). وتم عمل المنحدر اللوجيستي واثبت وجود العلاقة بين متلازمة الاكل ليلا والتوتر النفسي والمستوى العالي للتعليم والارق، كما اثبتت ان متلازمه الاكل ليلا اقل نسبة حدوث مع ممارسة الرياضة. **التوصيات:** واخيرا يوصي بالآتي لتحسين جودة مريض السمنة الذي يعاني أيضا من متلازمة الأكل ليلا: عمل دراسات تشمل مشاركات من المناطق الريفية وعمل دراسات اخري تشمل عدد اكبر من المشاركات في محافظات مختلفة من الجمهورية لمعرفة حجم المشكلة ومدي تأثيرها علي جودة الحياة.