Night Eating Syndrome and Palatable Eating Motives Among Medical Students

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Abstract. One of the night eating syndromes (NES) characters is night-time overeating. People with NES might have no control over the amount and kind of food. This could lead to excessive energy intake, hence causes overweight and obesity. We wanted to determine the prevalence of NES and association of NES with palatable eating motives. It was a cross sectional study which was conducted in May 2021 at the Faculty of Medicine Universitas Islam Indonesia (FMUII). Based on the research criteria, there were 100 first year students that were eligible to participate in this study. First, all the subjects received some procedures by zoom meeting. The three-day food record was used to assess dietary intakes. Night eating diagnostic questionnaire (NEDQ) and palatable eating motives scale (PEMS) were distributed to assess the eating behaviour. The incident of NES was 82%, divided into three severities and there were 16% subjects with severe NES. The NES severity was positively associated ($p = 0.024$) with desire of eating some palatable foods. The NES subjects consumed some snacks an hour after dinner. The NES severity was associated ($p = 0.36$) with energy intake at night. Although our data did not show an association between NES and body mass index (BMI), some studies found a positive association. As we know BMI is related to cardiovascular risk in general population. Therefore, we concluded that the incident of NES is positively associated with palatable eating motives and energy intake at night among students. Therefore, the university should initiate promoting healthy eating behaviour among their students..

Keywords: Night Eating Syndrome · Palatable Eating Motives · Cardiovascular Risk · University Students · Obesity

1 Introduction

Night eating syndrome (NES) has become a growing concern because of its possible association with obesity.[1] Firstly, NES was first described over 50 years ago and it is recently characterized by nocturnal hyperphagia (≥25% of daily caloric intake after the evening meal) at least two episodes per week; awareness of those eating episodes; and the presence of at least three of these symptoms: anorexia in the morning, a strong desire to eat between dinner and sleep or at night, disturbed sleep pattern, a belief that one should eat before sleep or when go back to bed, and an evening mood disturbance. These

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symptoms are experienced for at least three months.[2] Initially, NES was described in obese people.[3] Recently, NES is present in other populations. The prevalence of NES in general population is 1.5%.[4].

There are various motives that drive one to eat tasty foods. Someone might eat moreish foods for normal or adaptive reasons and or for less adaptive ones. This eating behavior is consistently associated with higher recent body mass index (BMI) and weight gain over time.[5] Burgess et al. developed "Palatable eating motives scale" (PEMS) and used it to identify unique motives for eating tasty foods.[6] Tasty foods are typically calorie-dense which play a role to obesity. Moreover, if these foods are used to deal with challenging life events, they could also adversely affect psychological health. It is necessary to understand one's motivations to eat these foods to help inhibit and treat obesity.[7].

A significant increase in obesity has been found amongst young age (18–29 years old).[8] In developing countries, the obesity prevalence is 2–12% and overweight is 29%. The weight of young adults in developing countries increases 1 kg/year, higher than that in developed countries.[9] There have been significant dietary changes in the last 30 years, namely larger portions, more fat, and or sugar in addition to easy access to meals and reduced physical activity level (PAL). All of these become major factors that worsen the obesity and overweight prevalence in developing countries.[10] University students belong to the susceptible group to be exposed to NES and emotional eating motives. The transition from adolescence to early adulthood is a critical period for developing an eating disorder.[11] Then, we determined the prevalence of NES and the association of NES with palatable eating motives.

2 Method

2.1 Study Design and Participants

We carried out a cross-sectional observational study in FMUII during May 2021. The sample size was calculated according to the Lemeshow formula. Consecutive sampling was used to recruit participants by online flyers on social media networks. The study inclusion criteria were: $\geq$ 18 years old and registered as the first-year students during the 2020–2021 academic year. Students who neither completed the entire research questionnaires nor experienced eating behavior disorders and or sleep disorders based on their medical history were excluded from this study.

The study was authorized by the FMUII Ethics Committee (11/Ka.Kom .Et/70/KE/II/2021) and the Helsinki Declaration principles were observed at all times. To preserve the confidentiality of the participants, the questionnaire data were entered into a database and identified exclusively by a numerical order. All the subjects agreed to provide their personal information regarding the purpose and the procedures of our study, and they were willing to write an informed consent.

2.2 Procedures and Research Instruments

All the subjects were invited to answer a Sociodemographic information form and to fill self-report composed by four questionnaires: the 3x24 hours food records, the palatable eating motives scale (PEMS) questionnaires, the night eating diagnostic questionnaires (NEDQ), and the Pittsburgh sleep quality index (PSQI).

2.2.1 Sociodemographic Information Form

This form was developed to obtain information about participants such as age, gender, height, and weight. The body mass index of the participants was obtained from their answers regarding their height and weight. BMI was calculated using the formula BMI = weight (kg)/height2(m). A BMI below 18.5 is considered as underweight, 18.5–22.9 normal weight, 23.0–24.9 overweight, 25.0–29.9 obese (class I), $\geq$ 30.0 obese (class II).[12].

2.2.2 The 3x24 Hours Food Records

The subjects were asked to record in household measures, at the time of consumption, all the foods and beverages eaten (including snacks), for a specified period. Detailed descriptions of all the foods and beverages (including brand names) and their method of preparation and cooking should also be recorded.[13].

2.2.3 The Night Eating Diagnostic Questionnaires

The Indonesian validated version of the NEDQ is used to assess the night eating behavior. The NEDQ is composed by 22 questions (often yes/no) assessing mood, sleep difficulties, morning anorexia, food cravings, food intake after evening meal, nocturnal awakenings with ingestion of food, awareness, and feelings of control during eating episodes.[14].

2.2.4 The Palatable Eating Motives Scale

The Indonesian validated version of the PEMS comprises 19 Likert-like five-choice frequency response items that probed various motives for "eating tasty food and drinks". Examples of tasty foods/drinks are provided in the instructions under the general categories of fast foods, sweets, salty snacks, and non-alcoholic sugary drinks. Each item uses a 5-point Likert-like scale from 1 = "almost never/never" to 3 = "half the time" to 5 = "almost always/always". These PEMS items are categorized into one of four motives: coping (e.g., "to forget about your problems"), reward enhancement (e.g., "because it gives you pleasant feeling"), social (e.g., "to celebrate a special occasion with friends"), and conformity (e.g., "because your friends or family want you to eat or drink these foods or drinks"). Motives scores are calculated by computing the mean of responses across items that comprise each motive.[15][16].

2.2.5 The Pittsburgh Sleep Quality Index (PSQI)

The Indonesian validated version of PSQI is an effective instrument used to measure the quality and patterns of sleep-in adults. It consists of 19 questions; each of which has 7 items rated between 0–3. These items are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disorder, sleeping pill use, and daytime dysfunction. The PSQI score is obtained by the total score of the seven items ranging between 0–21. High scores are associated with poor sleep quality and high levels of sleep disorder. More specifically, scores above 5 mean clinically poor sleep quality.[17].

2.3 Statistical Analysis

The normality of the continuous variables was tested by a one-sample Kolmogorov-Smirnov test. Continuous variables with normal distribution were presented as mean (standard deviation [SD]); non-normal variables were reported as median (interquartile range [IQR]). Qualitative variables were expressed with frequency (f) and percentages (5) and Chi-square test was used to compare these data. For a comparison, quantitative variables and the Mann Whitney U test were used in another case. All the statistical calculations were evaluated within the 95% reliability range and at a $p < 0.05$ significance level. All the statistical analyses were performed with IBM SPSS Statistics for Windows.

3 Result and Discussion

3.1 Sociodemographic Data

There were 100 participants in our study. Most of the participants were female (75%), and the median age was 19 (18–21) years. Regarding nutritional status, the majority were eutrophic (38%). The male subjects' BMI was higher than female (Table 1).

Table 1. Subjects' characteristics

Variables	Male (n = 25%)	Female (n = 75%)
Age (years)	19 (18–21)	
Height (cm)	169 ± 5	158 (150–174)
Weight (kg)	74 ± 17	53 (39–88)
BMI (kg/m^2)	25,87 ± 5,46	21,07 (15,62–33,95)
Nutritional status (BMI)		
Underweight	18%	
Normal	38%	
Overweight	13%	
Obese (class I)	23%	
Obese (class II)	8%	

Table 2. Intakes of energy and macronutrients

Variables	Intakes	Proportion of RDA (%)
Energy (kcal/day)	2822 ± 806	120 ± 31
Protein (g/day)	136 (47–450)	190 (77–234)
Lipid (g/day)	109 ± 42	155 (61–324)
Carbohydrates (g/day)	291 (82–776)	81 ± 31
Proportion of RDA (%)	Male (n = 25%)	Female (n = 75%)
Energy	127 ± 34	118 ± 31
Protein	193 ± 79	190 (78–234)
Lipid	163 ± 69	159 ± 56
Carbohydrates	85 ± 40	80 ± 27

Table 3. The night eating syndrome in subjects

NES	n (%)
Normal	18
Light	32
Moderate	34
Severe	16

3.2 Subjects' Intake

Based on the recent Indonesian recommended dietary allowances (RDA) 2019, the mean of the students' energy intakes was higher than the allowances. The mean of dinner and after dinner energy intakes was 26 ± 0.4% to daily energy intakes. Moreover, it was presented at least two times per week. There was no difference ($p > 0.05$) in the energy intakes between the male and female participants (Tables 2 and 3).

3.3 Night Eating Syndrome

We found 82% NES students, who were divided into three levels of NES severity. Most of the students (34%) had moderate NES. They had had NES for 3–6 months.

We assessed the subjects' sleep pattern by PSQI, showing that the subjects' sleep quality was 9 (5–16) or generally categorized as poor quality. As many as 59% of the subjects had a poor sleep quality, and 32% of them had a very poor quality. None of the subjects had a good sleep quality. Some subjects (38%) experienced sleep disturbances 1-2x per week and only 10% stated that they had never experienced sleep disturbances in the past month. The three main things that disturbed the subjects' sleep were cold temperatures at night, nightmares, and waking up in the middle of the night or too early. These then possibly led to the fact that a small percentage (4%) of the subjects took

Table 4. The palatable eating motives in subjects

NES	n (%)
Negative emotion	
Less (1–3 scores)	29
Similar (4–6 scores)	68
Severe (7–9 scores)	3
Positive emotion	
Less (1–3 scores)	6
Similar (4–6 scores)	65
Severe (7–9 scores)	29
Healthy levels	
Very good	8
Good	58
Moderate	29
Poor	5
Weight loss in last 3 months	
No	67
Yes	33
Reasons of palatable foods consumption	
Helping when depressed/ nervous	20
Making cheerful when were in bad mood	46
Losing worries	16
Burying unpleasant problems	18

sleeping pills 1-2x per week and some also experienced daytime dysfunction 1-2x per week.

The subjects stated that they ate snacks > 25% of their daily intake after dinner. The NES severity levels were associated ($p = 0.036$) with the students' intakes of night snacks. The subjects took dinner at 6–7 PM, followed by snacks, and then slept at 11 PM. In addition, 20% of the subjects had a strong urge to snack, the number of which was close to the number of the subjects with severe NES (16%). Several subjects slept at 12 PM or 1 AM and they consumed more snacks. The subjects who started sleeping later, would wake up later in the next day. Another NES symptom is skipping breakfast. There were 27% of the subjects who always skipped breakfast.

3.4 Palatable Eating Motives

Most of the students had similar palatable eating motives when they were in negative emotion or positive emotion. They tended to eat more when in a positive emotion. In fact, the NES severity was associated ($p = 0.024$) with tasty food eating motives (Table 4).

4 Discussion

The NES prevalence in our subjects was worrying. Our NES prevalence was approximately two times higher than those of other previous studies which included college students. About 82% of our students met the proposed criteria for NES, 16% of them were in severe NES. The NES prevalence was more frequent in college students and between ages 18–30 years old.[18] The prevalence of NES was around 1.1–1.5% in general population.[19] However, Asian population had a higher prevalence of NES. Proportion of NES in Omani adult population was 30%.[20] The NES prevalence in Malaysian public university students was 12% [21], similar with a report of NES among the population in Brazil which was 15%;[22] in Turkey 10–11%;[23][24] and in Italy 5%.[25] Several studies stated higher NES prevalence for medical students. There were 49% medical students in Pakistan who suffered from NES[26] and 39% in Malaysia,[27], while a lower prevalence (10%) was reported in a study involving Arabian medical students.[28].

Even findings from other countries should be interpreted cautiously due to diversity and distinctiveness in their socio-demographics, culture, and industrialization that might influence university students' behaviors. Night eating syndrome as a part of eating disorders (EDs) had spread among Asian countries closely related to economic transformation. Japan had first experienced EDs in the mid-1970s, followed by Hong Kong, Singapore, Taiwan, and South Korea. The second wave of EDs encompassed some Southeast Asian and South Asian countries.[29] Industrialization in Indonesia occurred in various phases. After the crisis period in 1997, Indonesian industry was more competitive in 2005.[30] The transformations included fundamental shifts in our population demographics, traditional family structure, and food supply. Local food environment played a significant role in the eating behaviors of our subjects. The availability of 24 h restaurants or late hour restaurants and the availability of food delivery applications allowed students to dine out conveniently. The top five of the subjects' night snacks were fried and or boiled instant noodles; biscuits; deep-fried snacks; sweet martabak, i.e., a thick folded pancake topped with condensed milk, refined sugar, chocolate and or cheese, and chocolate bar. Along with these snacks, they usually drank sweetened coffee or tea. Those snacks were included as moreish foods.

Hedonic eating is defined as the consumption of moreish foods which are tasty yet have high contents of fat, sugar, and salt so they are also energy dense. Therefore, it is not surprising that these foods contribute to weight gain and obesity. In the United States, mildly obese people had a tendency of eating more when facing a negative emotion, negative situation, or both, compared to underweight and normal weight people. On the other hand, underweight and normal weight people had a tendency of eating more when facing a positive situation.[31] Specifically, NES was positively associated with BMI in participants who were between 31–60 years old, but not in younger or older participants.[32] We did not find association between NES and or PEMS with

our subjects' BMI, but the data showed nutritional status transition after a year. Firstly in 2020 or when first admitted as medical students, 48% of the subjects had normal weight and 34% of them were overweight and obese. One year later, the percentage changed, i.e., 38% had normal weight while 44% of them were overweight and obese. Fortuitously, their first year as medical students were when the Covid-19 pandemic hit, and they had to study online.

Emotional eating is an overeating behavior due to feelings of anger, fear, and anxiety. Food choice is considered a way out to get pleasure, security, and comfort. Physical isolation during the pandemic has been shown to have a negative impact on individual mental health. Subjects with high levels of depression were at risk of having an eating disorder 1.04x ($p < 0.05$; 95% CI 1.00–1.08) higher than others.[33] Another study showed that physical isolation had a role in increasing anxiety levels.[34] The prevalence of anxiety increased by 29% in China during the pandemic.[35] Anxiety was known to play a role in worsening diet quality.[36] Several studies showed that snacking was one way to reduce anxiety during physical isolation.[37][38][39] The anxiety escalation was associated with enhancement of meat and sweetened food intakes in women.[40] In line with that, a study in Iran showed that there was an inverse relationship between anxiety and intake of vegetables and fruits.[41] The pandemic and lockdown increased the frequency of eating behavior by 52%, snacking behavior by 73%, and after dinner snacking behavior by 65%. Subjects who experienced worsening eating patterns had emotional eating behaviors more than three times.[42] Another study only on female subjects also showed similar results in which there was no enhancement in emotional eating during physical isolation.[43].

Our data showed that the number of students with poor-quality sleep during the pandemic was very high. During the online learning period, the use of digital media by the students increased significantly. This might result in sleep disturbances and increased depression level.[44] Our subjects were the first-year students who were still adapting from high school learning environment to the university learning environment. This situation was an additional challenge that might be related to their poor sleep quality and anxiety. The students were vulnerable to mental health problems, sleep disturbances, and irregular eating behavior, predisposing to emotional eating and NES.[45] These behaviors were associated to circadian rhythm disturbances, and subjects with this problem generally had impaired lipid and glucose metabolism.[46] The imbalance of circadian rhythm and biological clock were associated to obesity.[47] A higher calorie intake in the morning than later during daytime is associated with reduced susceptibility to weight gain. People who skip breakfast would get appetite enhancement and weight gain, making the risk for obesity higher.

5 Conclusion

In conclusion, the NES prevalence in our students was alarming. The positive association between NES and PEMS, either NES and the subjects' energy intakes at night in our study is important and needs further investigation. These results implicate future interventions which should include not only dietary but also behavioral aspects to support lifestyle changes among students.

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