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ABSTRACT

Background. Night eating syndrome is common practice in the community. The purpose of this study is to determine the prevalence of night eating syndrome among medical students and its correlation with depression at a public sector medical university in Karachi, Pakistan.

Methodology. It is a cross sectional study and the participants were selected by using multi-stage cluster sampling. Night Eating Syndrome Questionnaire (NES-Q) and Beck depression scale were used to determine the night eating syndrome and depression. Students of age group between 20 and 25 years were included. Comparison of night eating syndrome and depression between groups of students was determined through chi square and Mann-Whitney U test. Spearman correlation was used to determine the correlation of night eating syndrome with depression. P value <0.05 was considered significant.

Results. The mean age of participants was 21.48±4.08 years. Among students 49.36% and 27.84% were suffering from night eating syndrome and depression respectively (p < 0.05). Students were suffering from night eating syndrome had significantly higher Beck Depression Inventory (BDI) score compared to Non NEQ group with p value 0.03. A significant correlation was found between night eating syndrome scores and Beck depression inventory scale with p value was ≤ 0.05.

Conclusions. Results of this study found that medical students had high prevalence rate of night eating syndrome and depression. Depression was found to be a predictor of night eating syndrome.

Keywords: nighttime eating, obesity, medical students, gender

INTRODUCTION

Night eating syndrome (NES) is a condition which described as evening hyperphagia, nocturnal ingestions, and sleep and mood disturbances (1). Recent studies investigating the impact of pre-sleep nutrient intake have reported negative physiological outcomes in various populations (2). Thus a person with a habit of nighttime eating tends to eat more in the evening (3). This leads to a number of psychological and physical disorders which include obesity, insomnia, hypothalamic disorders, and depression. Apart from these night time eating also

causes high blood pressure, high cholesterol and diabetes (4).

Night eating syndrome is associated with some neuroendocrine disorders including decreased plasma concentrations of leptin and melatonin at night (5). This means that the person will tend to eat more at night due to low concentrations of leptin. The patient would also not be able to sleep properly due to low plasma levels of melatonin (6). This is due to alterations in the hypothalamic pituitary adrenal axis which is important for the sleep and awake cycles (7).

Eating behavior and circadian rhythm are proving to be important factors in the etiology of obesity (8). It is evident that prevalence of night eating syndrome is higher among obese populations than the general community (9). The exact relationship between night eating syndrome and obesity remains unclear (10). Night eating syndrome is found to be common in medical students and it causes weight gain (11). It remains to be determined whether this behavior indicates abnormal sleep patterns lead to nighttime wakefulness and food intake in those prone to weight gain (12).

Night eating syndrome has also been associated with life stress, low self esteem, low mood, depression and related psychopathology (13). Individuals with night eating syndrome who reported nocturnal snacking i.e. waking up from sleep to eat had more severe symptoms than those who did not wake to eat (14). Research also suggested that twenty minutes of muscle relaxation exercise significantly reduced the anxiety, stress and depression among these people (15).

Studies showed that the later a person dines, the more calories he is likely to eat, and the lesser sleeps, he will get depressed (16-17). Less sleep lead to a slower metabolism, and finally weight gain. Experiencing higher levels of stress may lead to night-eating behaviors in medical students (18). They have to cover enormous syllabus in a limited time period, there is sudden change in their style of studying, the thought of appearing or failing in exams leading to stress (19). When we eat late at night those calories are stored as fat which results in weight gain. This could be due to fluctuations in body temperature, biochemical reactions, hormone levels, physical activity and absorption and digestion of food (20). Finally, eating at night can cause acid reflux. Maintaining regular (early) meal timing is important for our health because eating late at night may prompt weight gain (21).

To perform the research on this topic is very much important because this condition is very common and very rare papers were published about it and this condition has many consequences such as loss of appetite at morning, increase appetite at evening and sleep disturbances. The purpose of this research was to explore the night time eating habits among medical students. Medical students are a highly vulnerable group and mainly due to a possi-

ble stressful life style. Late night studies can push this group to the habit of late night eating. This research will help the policy makers and institutional heads to formulate student friendly policies as well as the student community to make interventions into their life style. The objective of this study was to determine the prevalence of night eating syndrome and its correlation with depression among medical students in Karachi, Pakistan.

METHODS

Study setting and participants

This study was carried out at two public sector medical Colleges in Karachi. Each year, 350 medical students enrolled in each medical college to pursue total five years of study regarding medical education. Both male and female students were included in the study.

Study design and sampling technique

This was the cross-sectional study. The study participants were recruited through multistage cluster sampling, first two clusters were selected then each college sample collected through stratified sampling and within each college participants were selected through simple random sampling. Those students willing to participate in the study were included in the study. The questionnaires were circulated after seeking verbal consent and students were requested to return them within weeks.

Sample size

Sample size was calculated through World Health Organization Statistical Software for Health Studies. Total 316 students' sample was required to fulfill the objective of the study at 95% confidence interval, 5% margin of error and 29% prevalence of prevalence of night eating syndrome from a previous study (15).

Data collection procedure

After the approval of respective medical universities' administration, students for each year of respective medical university were approached, briefed about the study objective and self-administered questionnaires were distributed to the students. Participation was voluntary. The content of

the questionnaire was explained to each participant individually. The questionnaire was returned back after completion by the participants.

Inclusion criteria and exclusion criteria

The inclusion criteria was the age of the participants from 18 to 26 years who expressed their will to participate in the study. Exclusion criteria for study participants was the case of students who had already been diagnosed and treated for any psychological disorder. Family history of psychological disorders was also excluded. All those who did not give their consent were also excluded.

Data collection tool

A validated and structured questionnaire was used. The first part included night eating questionnaire (12) to determine the night eating behavior, the second part included back depression inventory to determine the depression and third part included back anxiety inventory to determine the anxiety. These questionnaires were modified after pretesting and developed into a final version. The questionnaire was consisting of four parts namely, student's profile, night eating evaluation, depression and anxiety levels of students. Demographic details of subjects included age, gender, and year of study. Night eating syndrome was assessed by 38 items (13) scales, it consisted of four subscales: restraint, eating concern, weight concern and body shape concern. It is contained 14 questions about symptoms rated on a 5-point Likert-type scale which was then summed up to obtain a NEQ Global Score. A total score ≥ 25 has been proposed as a lenient threshold for NES. Depression was assessed by 21 items self scale (14). It measured emotional, social, cognitive, and motivational symptoms related to depression. Each of the 21 items on the survey had four statements to be chosen from relating to how the participants felt in the past few days.

Data variables, statistical analysis and ethical consideration

The dependent variables were night time eating, depression and the independent variable were age, gender, academic year of study, body mass index (BMI) and smoking history of the participants. Data was entered and analyzed in Statistical Pack-

age for Social Sciences 20.0 (SPSS, Inc., Chicago, IL, USA). Mean and proportion were calculated for descriptive statistics. Chi-square test was used to determine the difference between night time eating and non-night time eating groups. Mann-Whitney U test was applied to determine the mean score of night time and non-night time eating groups. Results were recorded as frequencies, means \pm standard deviations (SD), p values. For all purposes, a p value of < 0.05 was considered as the criteria of significance. Study protocol was approved from the ethical committee of JSMU (IRB-UGS-2020-03-064). Informed written consent was taken prior to fill the questionnaire. The participants were assured confidentiality and given option to quit from the study without any further questions and implications.

RESULTS

Mean age (SD) of study participants was 21.48 ± 4.03 years. Most (75.9%) of the study participants were female, 68.35% never smoked in their life, 20.25% were overweight and 5.44% obese [Table 1].

Majority (49.36%) of students were suffering from night eating syndrome. 27.84% of the participants were suffering from depression. Among night eating syndrome students, 32.05% were suffering from severe depression [Table 2].

Mean and SD of restraint, eating, weight and shape concern among nighttime eating syndrome affected students were 2.76 ± 1.23 , 1.23 ± 0.87 , 3.45 ± 1.56 and 2.98 ± 1.03 respectively. Mean and SD of depression among night eating syndrome affected was 19 ± 3.50 with p value is 0.03 [Table 3].

Statistically significant correlations between the NEQ and depression scale were found, and some of them were positive correlation as depression increased, so did NES behavior increase. The significant NEQ items included: "How often do you have trouble sleeping at night?" ($r = 0.41$, $p = 0.05$), "Other than to use the bathroom, how many times do you wake up in the middle of the night?" ($r = 0.21$, $p = 0.002$), "When you wake up during the night, how many times do you go eat a snack?" ($r = 0.29$, $p = 0.003$), "What is your current level of feeling blue or down in the dumps?" ($r = 0.5$, $p < 0.002$), "What are your cravings to eat when

TABLE 1. Socio-demographic characteristics among study participants between groups (**NES and Non-NES)

Characteristics	Total (n = 316)		NES (n = 156)		Non-NES (n = 160)		p-value*
	n	%	n	%	n	%	
Age (years) (mean ±SD)	21.48	4.03	21.48	4.03	21.48	4.03	
Gender							0.06
Male	76	24.1	51	32.69	25	15.62	
Female	240	75.9	105	67.31	135	84.38	
Academic year of study							0.04
First year	7	2.2	3	1.92	4	2.5	
Second year	35	11.1	10	6.41	25	15.62	
Third year	59	18.7	18	11.53	41	25.62	
Fourth year	175	55.4	95	60.89	80	50	
Fifth year	40	12.7	30	19.23	10	6.25	
Smoking							0.05
Ever	100	31.65	56	35.89	44	27.5	
Never	216	68.35	100	64.11	116	72.5	
Body Mass Index (BMI)							0.03
Underweight (BMI ≤ 18.5)	30	9.44	10	6.41	20	12.5	
Normal (BMI 18.5-24.9)	205	64.87	86	55.12	119	74.37	
Overweight (BMI 25-29.9)	64	20.25	50	32.05	14	8.75	
Obese (BMI ≥ 30)	17	5.44	10	6.41	7	4.37	

TABLE 2. Prevalence of nighttime eating and depression among study participants (n = 316)

Characteristics	Frequency (n)	Proportion (%)
Normal Eating*	160	50.64
Nighttime Eating Syndrome (NEQ Global Score >25)	156	49.36
Depression	88	27.84
Depression in NES group (n = 156)	50	32.05

* NEQ scale (0-25 = normal, > 25 = nighttime eating syndrome)

TABLE 3. Comparison of eating disorder symptomatology and psychosocial health between study participants (n = 316)

	Total Sample (n = 316)		NES (n = 156)		NON-NES (160)		P value*
	Mean	SD	Mean	SD	Mean	SD	
EDE-Q							
Restraint	1.66	1.03	2.76	1.23	1.11	0.87	0.04
Eating	1.32	1.07	1.23	0.87	1.29	1.02	0.05
Shape	1.98	0.98	3.45	1.56	1.87	1.67	0.04
Weight	1.56	0.95	2.98	1.03	1.23	1.1	0.02
Global	1.43	1.04	2.34	1.08	1.38	1.15	0.01
BDI Scale	8	2.5	19	3.5	13	2.1	0.03

*Mann Whitney U test, BDI=Back depression inventory scale, EDE-Q= eating disorder examination questionnaire

you wake up at night?” ($r = 0.19$, $p < 0.005$), and “When you wake up at night, do you feel the need to eat before you can fall back to sleep?” ($r = 0.65$, $p = 0.03$). A significant correlation was also found between Beck Depression Inventory scores and NEQ scores ($r = 0.74$, $p = 0.012$) [Table 4].

Distribution of all subjects with NES was done according to BMI category. Across five BMI categories the prevalence of NES increased as BMI

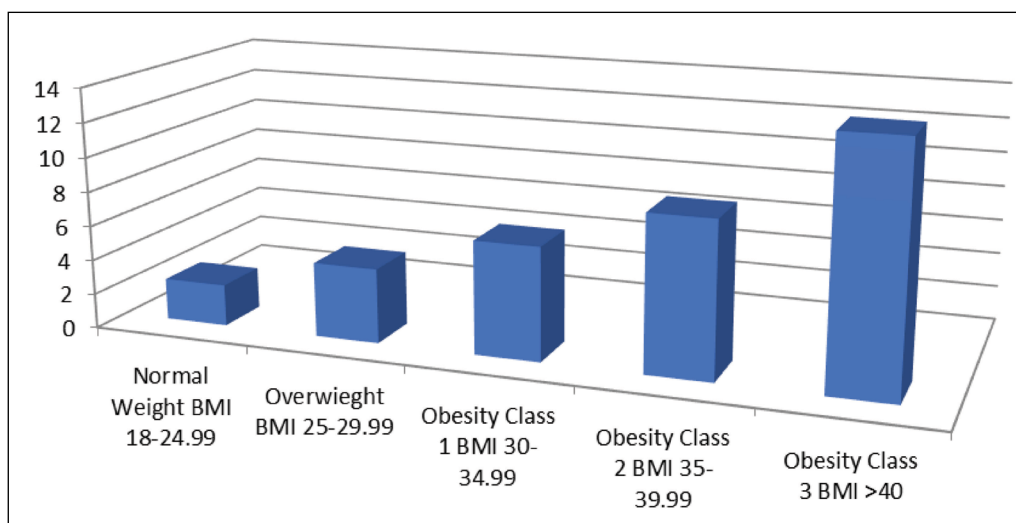
increased, and was found to be statistically different between the groups ($P = 0.001$) [Figure 1].

DISCUSSION

Night eating syndrome was common among medical students and depression was also high in prevalence among night eating syndrome group. This study found that depression was one of the

TABLE 4. Correlations of Beck depression inventory scores with night eating syndrome items scores (n = 316)

Night eating syndrome items	M	SD	Correlations with Beck depression inventory total scores (r)	p value
Morning appetite	2.62	1.01	-.08	0.030
First meal of day	1.41	0.21	-.02	0.011
Percentage of calories consumed after supper	1.38	0.19	-.05	0.051
Trouble sleeping	1.56	0.05	.41	0.052
Number of times per night awake	1.12	0.31	.21	0.021
Number of times per night snacking	0.12	0.01	.29	0.031
Level of awareness	4.96	1.2	-.01	0.061
Level of feeling blue	1.85	0.15	.59	0.022
Time of day when mood is lowest	1.9	1.21	-.07	0.041
Cravings or urges to eat after supper	2.2	1.01	.19	0.051
Cravings to eat when wake up at night	0.77	0.2	-.02	0.021
Need to eat to fall back asleep	0.23	0.1	.65	0.032
Control over night eating	0.54	0.09	-.15	0.011
Nighttime eating syndrome (Global score)			0.74	0.012

**FIGURE 1.** Distribution of all subjects with NES, according to BMI category

factor which led to nighttime eating syndrome. The result of study also found that body mass index increased as NES increased.

The result of the study found that 49.36% of students were suffering from NES and this prevalence was higher than general population which was found to be 30% (22). In a study conducted in the US in 2014 to find out the prevalence of night time eating among university students showed that only 4.2% of the students were suffering from night eating syndrome (23). Thus, it can be interpreted that night time eating is much more common among medical students of Pakistan as compared to the US.

This study found that the frequency of first year medical students who indulged in night eating was 1.92%. However, this percentage was higher to 60.89% in fourth year medical students. These results are in consistence with other another study results which show that as the academic year is increased the NES is also increased (24).

According to our study, 67.31% of the total number of females were suffering from NES. The prevalence of night eating syndrome in male medical students was found to be 32.69% which meant that females tended to night time eating much more compared to males. However, in a study conducted

in the US among students, only 20.6% of the women suffered from night eating syndrome (25). From this we can interpret that female medical students in Karachi tended to have food at night more than males' medical students.

In this study, 20.25% were medical students were overweight and 5.44% were obese. Among overweight students, 32.05% were suffering from NES. This study results were consistent with other study results (26). This shows that students well aware of the fact that night eating syndrome leads to obesity as discussed in a research that was previously conducted that night eating syndrome was positively associated with BMI (26).

This study showed that depression was common (27.84%) among NES students' groups. This result is consistent with other study results (27). The association between NES and depressive symptoms has been verified in several studies (27-29). A previous study reported that 75% of the depressed students were NES diagnosed (30).

This study results found that there was a significant correlation ($r = 0.65$, $p = 0.03$) between NES and depressive symptoms. These results are similar with other study results which shows that revealed a substantial correlation between NEQ and depres-

sion scores among students. A study showed that depression might be a confounding factor on the relationship between NES and depression (31).

Our study findings show that as BMI increase the NES is also increased. This result is also confirmed with other study results (32) Another study found that those participants who had NES had most likely increased BMI (32-33).

There were several limitations of our study results. First it was the cross-sectional study which cannot determine the temporal relationship. Second there were several confounding factors such as late time sleep, late time eating and skipping morning eating are all attributes of university students that may confound the findings. Third, the data is self-reported and there is information bias in the study.

CONCLUSIONS

This study found that high prevalence of night eating syndrome among medical students in Karachi and that depression is the important predictor for night eating syndrome. Spreading its awareness especially in the medical education institutions is something that needs to be addressed.

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