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A Cross-Sectional Study on Assessing the Prevalence of Night Eating Syndrome Among Young Adults in Chennai

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Abstract:

- ***Background:***
  Night Eating Syndrome (NES) is an eating disorder characterized by delayed circadian pattern of food intake, evening hyperphagia, and nocturnal eating episodes. It is increasingly observed among young adults (college students) since they are exposed to academic stress and irregular sleep patterns.

- ***Aim:***
  To estimate the prevalence of Night Eating Syndrome among young adults using the Night Eating Questionnaire.

- ***Methods:***
  A cross-sectional questionnaire-based study was conducted among young adults using the standardized Night Eating Questionnaire (NEQ). Demographic data, sleep habits, eating behaviours, and anthropometric measurements were collected. NEQ scores were calculated, and prevalence of NES was determined using established cutoffs.

- ***Results:***
  A total of 229 participants were included. The mean NEQ score was 15.15 ± 7.16. Using screening thresholds, 9.61% participants showed possible NES (NEQ ≥25), while 2.62% showed strong indicators of NES (NEQ ≥30). NEQ scores varied across BMI categories, suggesting a possible relationship between night eating behaviour and body weight. NES has significant association with depression among the participants.

- ***Conclusion:***
  Night eating behaviors are present in a significant proportion of participants, highlighting the need for awareness and early lifestyle interventions.

Keywords: *Night Eating Syndrome, NEQ, Eating Behaviour, BMI, Young Adults, College Students.*

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I. INTRODUCTION

Night Eating Syndrome is conceptualized as a circadian-related eating disorder in which the main food intake is shifted to the evening and night, often accompanied by nocturnal awakenings with eating and morning anorexia.

Despite being first described in scientific journals over half a century ago, night eating syndrome (NES) is a unique eating problem that receives little recognition or clinical treatment. In the 1950s, NES was initially identified in a subgroup of obese people undergoing weight-loss therapy. According to the study done by Stunkard et al, the NES subgroup had early sleeplessness or difficulty going asleep,

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evening hyperphagia, and minimal morning hunger. Besides this first description, different criteria have been utilized to diagnose NES, with Birketvedt et al introducing nocturnal ingestions - that is, awakening during the sleep period to eat - as a significant alteration. Research has shown correlations between NES and eating disorders (ED), maladaptive coping, and poor psychological and physical well-being [3]. In a research study, young adults were more likely than the rest of the population to experience nighttime hyperphagia.

Approximately 300 million individuals worldwide, or 4.4% of the total population, suffer from depression, making it one of the most prevalent mental health conditions. The World Health Organization lists depression as the third leading cause of illness globally. It has been observed that NES sufferers experience more severe depressive symptoms.

➢ *Justification of Study:*

College students are a vulnerable group for disordered eating behaviours due to lifestyle changes, academic stress, irregular schedules, and greater autonomy over food choices. These factors contribute to disrupted eating patterns, making them a high-risk population for Night Eating Syndrome (NES).

NES remains underdiagnosed and often overlooked in clinical and research settings, especially among young adults. Despite being included in the DSM-5 as an Other Specified Feeding and Eating Disorder (OSFED), there is limited awareness about its symptoms and consequences. Studying its prevalence among young adults of age group 18 – 25 years can help bring attention to this condition.

NES is associated with poor sleep quality, depression, anxiety, and fatigue—all of which can negatively affect academic performance and overall well-being. Early identification in young adults could support timely interventions to improve mental health and academic success.

➢ *Etiology and Pathophysiology*

The etiology of NES is multifactorial, involving complex interactions between circadian rhythm dysregulation, psychological distress, and metabolic factors[9]. Several neurobiological mechanisms have been implicated:

- Circadian Rhythm Dysregulation: NES is characterized by a delayed endogenous circadian rhythm of hunger, satiety, and eating behavior. Abnormalities in melatonin secretion, cortisol patterns, and temperature regulation have been documented in individuals with NES[10]. The delayed eating pattern is often synchronized with delayed sleep onset, suggesting a phase shift in the circadian system.
- Serotonergic Dysfunction: Lower serotonin levels in the evening have been proposed as a potential mechanism, as serotonin dysregulation is implicated in both mood disturbance and feeding regulation[11]. Selective serotonin reuptake inhibitors (SSRIs) have shown efficacy in reducing nocturnal eating and improving mood in some NES populations[12].
- Stress and Mood Pathways: NES frequently co-occurs with depressive and anxiety disorders[13]. Emotional stress and negative affect appear to trigger or exacerbate nocturnal eating episodes. The "emotional eating" hypothesis suggests that individuals with NES use eating as a maladaptive coping mechanism in response to evening or nighttime mood disturbance[14].
- Metabolic and Neuroendocrine Factors: Some research has identified alterations in ghrelin and leptin levels in NES populations, though findings are inconsistent[15]. Insulin resistance and impaired glucose metabolism have also been reported, though whether these are causes or consequences of NES remains unclear[16].

➢ *Associated Factors and Comorbidities*

Research has consistently demonstrated associations between NES and multiple demographic, psychological, and behavioral factors:

- Depression and Anxiety: Meta-analytic reviews report that individuals with NES are 2–3 times more likely to meet criteria for Major Depressive Disorder or generalized anxiety disorder compared to control populations[17]. The temporal relationship between mood disturbance and nocturnal eating episodes remains an area of active investigation.
- Weight Status and Weight Gain: Although NES can occur across all weight categories, studies in clinical obesity samples report NES prevalence rates of 6–16%[18]. The association between NES and weight gain appears bidirectional: weight-conscious individuals may develop NES due to daytime dietary restriction and compensatory evening eating, while the high caloric intake during evening/nocturnal episodes may promote weight gain[19].
- Sleep Disorders: Nocturnal sleep-related eating disorder (NSRED) and insomnia frequently co-occur with NES[20]. Some evidence suggests shared underlying circadian dysregulation. Individuals with NES often report difficulty initiating sleep, frequent awakenings, and nonrestorative sleep[21].
- Residential Status and Lifestyle Factors: Preliminary evidence suggests that residential status (hosteller vs. day scholar) may influence eating patterns through differences in meal scheduling, food availability, and psychosocial stress[22]. Medical and professional students, in particular, report higher stress levels that may contribute to disordered eating patterns[23].

➢ *Rationale for Current Study*

While NES is increasingly recognized in Western populations, very limited epidemiological data exist regarding NES prevalence among Indian college students, particularly in Chennai. College students represent a critical population for investigation, as the transition to university life often involves significant circadian disruption, dietary changes, psychological stress, and mood disturbance—all of which may precipitate or exacerbate NES[24]. Additionally, medical students face particular occupational stress due to demanding curricula, irregular schedules, and high

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expectations[25], potentially rendering them especially vulnerable to NES and associated mental health comorbidities.

The current study aims to: (1) establish prevalence estimates of NES and NES-related symptoms in a diverse sample of young adults in Chennai, (2) examine associations between NES features and gender, (3) explore relationships between depressive mood and NES symptomatology, and (4) evaluate associations between NES features and self-reported weight gain. Understanding these associations will inform targeted interventions and guide clinical recognition of NES in this population.

Early identification in young adults could support timely interventions to improve mental health and academic success.

II. METHODS

➢ *Study Design and Setting*

This was a cross-sectional, questionnaire-based survey conducted from March 2025 to May 2025 in Chennai, Tamil Nadu, India.

➢ *Study Population and Sampling*

- Inclusion Criteria: College students aged 18–25 years .Willing to provide informed consent
- Exclusion Criteria: College students with known psychiatric currently under treatment Unwilling to participate or unable to complete the questionnaire.
- Sample Size: A total of 229 college students were recruited through convenience sampling across various institutions
- Participant Characteristics: The sample consisted of 109 female participants (47.5%) and 120 male participants (52.5%), with a mean age of 21.5 years.

➢ *Instruments*

- Night Eating Questionnaire (NEQ): The primary outcome measure was a modified Night Eating Questionnaire adapted from the Allison et al. (2004) 14-item scale[26]. The instrument assesses key NEQ dimensions:

✓ Morning hunger: "How hungry are you usually in the morning?" (0–4 scale: not at all to extremely)
✓ Evening hyperphagia: "Do you have cravings or urges to eat snacks after dinner?" (yes/no); "What percentage of your daily food intake do you consume after dinner?" (0%, 1–25%, 26–50%, 51–75%, 76–100%)
✓ Control over eating: "How much control do you have over your eating after dinner?" and "How much control do you have over your eating when you snack in the middle of the night?" (0–4 scale: complete to none at all)
✓ Nocturnal ingestion: "Do you have cravings or urges to eat snacks when you are awake in the middle of the night?" (yes/no); "When you get up in the middle of the night, how often do you snack?" (frequency scale)
✓ Sleep disturbance: "How often do you have trouble getting to sleep?" (frequency scale); "Other than only to use the bathroom, how often do you wake up in the middle of the night?" (frequency scale)
✓ Mood disturbance: "Are you currently feeling blue or down?" (yes/no); "When you are feeling blue, is your mood lower in the evening/night time vs. other times of day?" (yes/no)
✓ Nocturnal awareness and distress: "When you snack in the middle of the night, how aware are you?" (0–4 scale); "How much control do you have over your eating when you snack in the middle of the night?" (0–4 scale); "How upsetting is your night eating to you?" (0–4 scale); "How much has your night eating affected your life?" (0–4 scale)
✓ Chronicity: "How long have your current difficulties with night eating been going on?" (duration in months/years)

- Demographic and Clinical Variables: Participants reported age, gender, course of study (medical, engineering, arts), year of study, residential status (hosteller/day scholar), and current medication use.
- Weight and Height: Participants self-reported current height (in centimeters) and weight (in kilograms). Body Mass Index (BMI) was calculated as weight (kg) / height $(m)^2$.
- Weight Gain: Participants responded to: "Do you feel like you have gained weight recently?" (yes/no). If yes, participants specified the amount of perceived weight gain (in kilograms).
- Depression Screening: PHQ – 2 questionnaire is used to exclude participants with psychiatric illness. A single-item measure was used: "Are you currently feeling blue or down?" (response options: not at all, a little, somewhat, very much, extremely). For analysis, responses were dichotomized into: "no depression" (not at all) and "depression" (any positive response).

➢ *Procedure*

Eligible participants were approached through google forms. After obtaining informed consent, participants completed a online questionnaire in a quiet setting, typically requiring 10–15 minutes. Completed questionnaires were submitted immediately after completion to minimize missing data.

➢ *Statistical Analysis*

- Descriptive Statistics: Means, standard deviations, and frequency distributions were calculated for all variables.
- NEQ Scoring: Individual NEQ items were scored according to item-specific scales (typically 0–4 for Likert-type items, or dichotomous yes/no). A total NEQ score was calculated by summing across applicable items, with higher scores indicating greater NES symptomatology. Items assessing control over eating were reverse-scored so that higher scores consistently indicated greater pathology.
- NES Case Classification: Participants were classified as meeting NES case criteria if they endorsed: (1) morning

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anorexia (score ≤ 1 on "How hungry are you in the morning?"), (2) evening hyperphagia (reporting ≥ 25% of daily intake after dinner or frequent cravings after dinner), (3) at least one episode of nocturnal eating per week on average, and (4) subjective distress or impairment related to nocturnal eating. This approach aligns with DSM-5 and ICD-11 diagnostic frameworks while accounting for symptom severity[27].

- Bivariate Associations: Chi-square tests (χ^2) were used to examine associations between NEQ score and BMI.
- Multivariable Analysis: Logistic regression models were constructed to examine independent associations between NES case status (dependent variable) and gender, depression, weight gain, and residential status (independent variables), controlling for age and year of study. Odds ratios (OR) and 95% confidence intervals (CI) were reported.
- Subgroup Analysis: Separate analyses were conducted for medical students vs. non-medical students, and for year of study (first-year vs. senior students), to examine whether associations differed by educational context.
- Statistical Software: All analyses were performed using SPSS version 19 .0 (IBM Corp., Armonk, NY).

➢ *Ethical Considerations*

IEC clearance has been obtained for the study. All participants provided informed written consent prior to study participation. Data were maintained confidentially and identified only by unique participant ID numbers. Participants were informed that completion was voluntary and that refusal to participate would not affect their academic standing or college experience. Contact information for mental health resources was provided to all participants, particularly those screening positive for depression or concerning NES symptoms.

III. RESULTS

➢ *Participant Characteristics*

A total of 229 young adults completed the questionnaire. Table 1 presents descriptive statistics stratified by gender.

Table 1 Gender Statistics

GENDER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	109	47.6	47.6	47.6
	Male	120	52.4	52.4	100.0
	Total	229	100.0	100.0	

Table 2 BMI Categories

BMI_category

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	149	65.1	65.1	65.1
	Obese	12	5.2	5.2	70.3
	Overweight	45	19.7	19.7	90.0
	Underweight	23	10.0	10.0	100.0
	Total	229	100.0	100.0	

Table 3 Day Scholar vs Hosteller

Residence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dayscholar	80	34.9	34.9	34.9
	Hosteller	149	65.1	65.1	100.0
	Total	229	100.0	100.0	

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The sample was predominantly male (52.4%, n = 120). The majority were medical students. Approximately 65% (n = 149) resided in hostels, while 35% (n = 80) were day scholars. BMI ranged from 14.8 to 35.26 kg/m² (M =22.91 , SD = 3.71). Overall, 34.1 % (n =78) reported recent weight gain, and 63.3% (n = 145) endorsed depressive mood symptoms.

➢ *Prevalence of NES and Subthreshold Symptoms*

Using the proposed diagnostic criteria (morning anorexia, evening hyperphagia, ≥ 1 nocturnal eating episode per week, and distress/impairment), approximately 2.62% (n = 6) of the sample met full NES case criteria. An additional 9.61% (n = 22) exhibited significant NES subthreshold symptoms (meeting 2–3 diagnostic criteria).

- *Key NEQ Findings:*

Table 4 NEQ Categories

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NES	6	2.6	2.6	2.6
	Normal	207	90.4	90.4	93.0
	Possible	16	7.0	7.0	100.0
	Total	229	100.0	100.0	

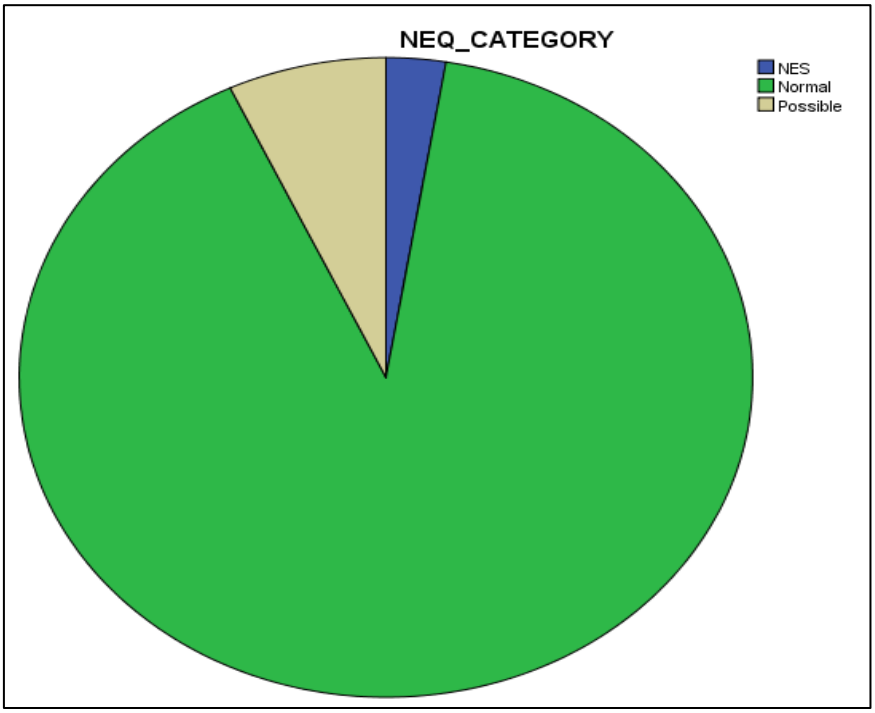

Fig 1 NEQ Categories

- *Morning Anorexia (Score ≤ 1): 55% (n = 126)*

Table 5 Morning Anorexia Severity

How hungry are you usually in the morning?_score

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	48	21.0	21.0	21.0
	1	78	34.1	34.1	55.0
	2	54	23.6	23.6	78.6
	3	49	21.4	21.4	100.0
	Total	229	100.0	100.0	

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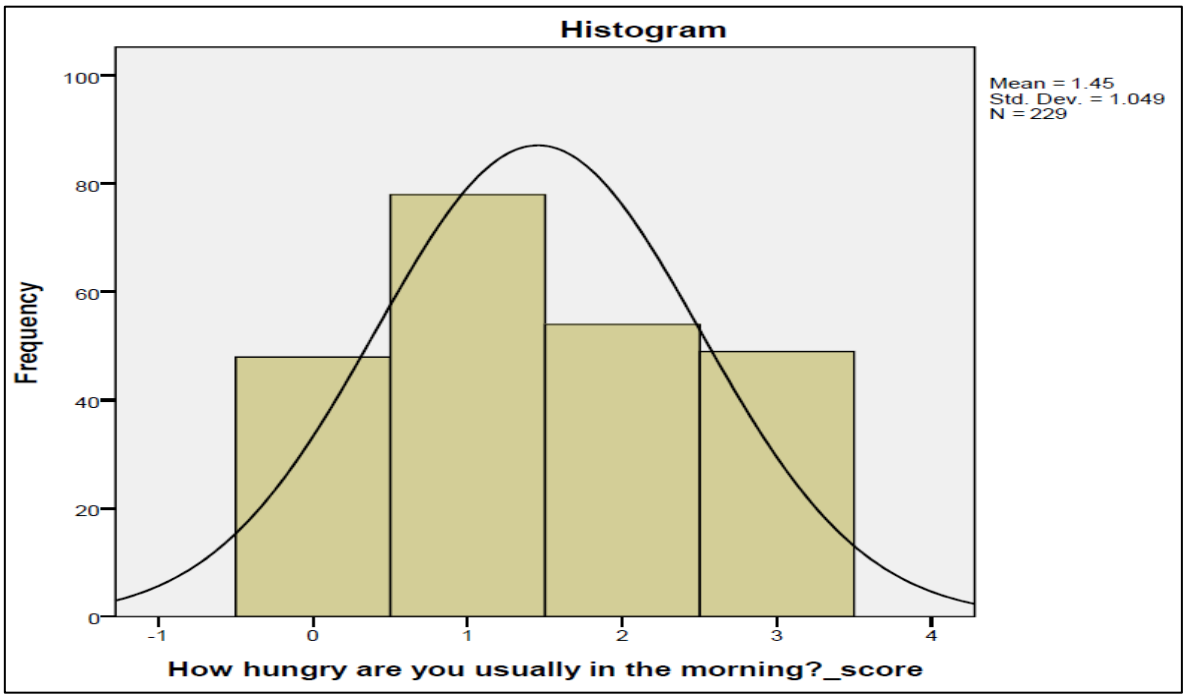

Fig 2 Morning Anorexia

- *Evening Hyperphagia (≥ 25% of Intake after Dinner or Frequent Cravings): 24.9% (n = 57)*

Table 6 Evening Hyperphagia

How much of your daily food intake do you consume after dinnertime ?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0% (not at all)	66	28.8	28.8	28.8
	1 - 25% (upto a quarter)	106	46.3	46.3	75.1
	26 - 50% (about half)	40	17.5	17.5	92.6
	51 - 75% (more than half)	14	6.1	6.1	98.7
	76 - 100% (almost all)	3	1.3	1.3	100.0
	Total	229	100.0	100.0	

- *Nocturnal Eating ≥ 1 per Week: 27.5% (n = 63)*

Table 7 Nocturnal Eating

Other than only to use the bathroom, how often do you get up at least once in the middle of the night?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	about once a week	41	17.9	17.9	17.9
	every night	6	2.6	2.6	20.5
	less than once a week	52	22.7	22.7	43.2
	more than once a week	16	7.0	7.0	50.2
	never	114	49.8	49.8	100.0
	Total	229	100.0	100.0	

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- *Awareness of Nocturnal Eating: 32.8% of those Eating Nocturnally Reported Full Awareness*

Table 8 Awareness of Night Time Food Consumption

When you snack in the middle of the night, how aware are you of your eating ?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		34	14.8	14.8	14.8
	a little	27	11.8	11.8	26.6
	completely	56	24.5	24.5	51.1
	not at all	51	22.3	22.3	73.4
	somewhat	42	18.3	18.3	91.7
	very much so	19	8.3	8.3	100.0
	Total	229	100.0	100.0	

- *Evening/Nocturnal Mood Disturbance: 31.4% (n = 72) Reported Mood Lower in Evening*

Table 9 Mood Disturbance

Are you currently feeling blue or down?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	a little	72	31.4	31.4	31.4
	extremely	9	3.9	3.9	35.4
	not at all	84	36.7	36.7	72.1
	somewhat	48	21.0	21.0	93.0
	very much so	16	7.0	7.0	100.0
	Total	229	100.0	100.0	

Table 10 Mood Disturbance in a Day

When you are feeling blue, is your mood lower in the:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		19	8.3	8.3	8.3
	afternoon	55	24.0	24.0	32.3
	down throughout the day	20	8.7	8.7	41.0
	early evening	20	8.7	8.7	49.8
	early morning	42	18.3	18.3	68.1
	late evening / night time	52	22.7	22.7	90.8
	latemorning	21	9.2	9.2	100.0
	Total	229	100.0	100.0	

- *Sleep Onset Difficulty: 29.7% (n = 68) Reported Frequent Trouble Falling Asleep*
- *Total NEQ Score: Mean = 15.15 (SD = 7.16), Range = 0–36.*

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➢ *Association with Gender*

Table 11 Chi Square for Gender * NEQ

GENDER * NEQ_category Crosstabulation

			NEQ_category			
			NES	Normal	Possible	Total
GENDER	Female	Count	1	104	4	109
		Expected Count	2.9	98.5	7.6	109.0
		% within GENDER	.9%	95.4%	3.7%	100.0%
		% within NEQ_category	16.7%	50.2%	25.0%	47.6%
	Male	Count	5	103	12	120
		Expected Count	3.1	108.5	8.4	120.0
		% within GENDER	4.2%	85.8%	10.0%	100.0%
		% within NEQ_category	83.3%	49.8%	75.0%	52.4%
Total		Count	6	207	16	229
		Expected Count	6.0	207.0	16.0	229.0
		% within GENDER	2.6%	90.4%	7.0%	100.0%
		% within NEQ_category	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.157[a]	2	.046
Likelihood Ratio	6.573	2	.037
N of Valid Cases	229		

Chi-square analysis revealed significant association between Gender and NES since $p < 0.005$

Overall NEQ total scores did not differ significantly between genders (female M = 19.2, male M = 17.6; $t(403) = 1.67$, $p = 0.10$).

➢ *Association with Depression*

Table 12 Chi Square for Depression * NEQ

Depression * NEQ_category Crosstabulation

			NEQ_category				
				NES	Normal	Possible	Total
Depression		Count	24	0	0	0	24
		Expected Count	2.3	.6	19.6	1.5	24.0
	No	Count	0	1	81	2	84
		Expected Count	8.0	2.0	68.7	5.3	84.0
	Yes	Count	0	5	126	14	145
		Expected Count	13.8	3.4	118.6	9.2	145.0
Total		Count	24	6	207	16	253
		Expected Count	24.0	6.0	207.0	16.0	253.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	259.184[a]	6	.000
Likelihood Ratio	165.153	6	.000
McNemar-Bowker Test	.	.	[b] .
N of Valid Cases	253		

Chi-square analysis revealed significant association between Depression and NES since $p < 0.005$.

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➢ *Association with Weight Gain*

Table 13 Chi Square for Weight Gain * NEQ

Weightgain * NEQ_category Crosstabulation

			NEQ_category			Total
			NES	Normal	Possible	
Weightgain	Absent	Count	4	141	6	151
		Expected Count	4.0	136.5	10.6	151.0
		% within Weightgain	2.6%	93.4%	4.0%	100.0%
		% within NEQ_category	66.7%	68.1%	37.5%	65.9%
	Present	Count	2	66	10	78
		Expected Count	2.0	70.5	5.4	78.0
		% within Weightgain	2.6%	84.6%	12.8%	100.0%
		% within NEQ_category	33.3%	31.9%	62.5%	34.1%
Total		Count	6	207	16	229
		Expected Count	6.0	207.0	16.0	229.0
		% within Weightgain	2.6%	90.4%	7.0%	100.0%
		% within NEQ_category	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.200[a]	2	.045
Likelihood Ratio	5.811	2	.055
N of Valid Cases	229		

Chi-square analysis revealed significant association between Gender and NES since $p < 0.005$.

Table 14 Chi Square for BMI * NEQ

BMI_category * NEQ_category Crosstabulation

			NEQ_category			Total
			NES	Normal	Possible	
BMI_category	Normal	Count	4	138	7	149
		Expected Count	3.9	134.7	10.4	149.0
		% within BMI_category	2.7%	92.6%	4.7%	100.0%
		% within NEQ_category	66.7%	66.7%	43.8%	65.1%
	Obese	Count	1	9	2	12
		Expected Count	.3	10.8	.8	12.0
		% within BMI_category	8.3%	75.0%	16.7%	100.0%
		% within NEQ_category	16.7%	4.3%	12.5%	5.2%
	Overweight	Count	1	40	4	45
		Expected Count	1.2	40.7	3.1	45.0
		% within BMI_category	2.2%	88.9%	8.9%	100.0%
		% within NEQ_category	16.7%	19.3%	25.0%	19.7%
	Underweight	Count	0	20	3	23
		Expected Count	.6	20.8	1.6	23.0
		% within BMI_category	.0%	87.0%	13.0%	100.0%
		% within NEQ_category	.0%	9.7%	18.8%	10.0%
Total		Count	6	207	16	229
		Expected Count	6.0	207.0	16.0	229.0
		% within BMI_category	2.6%	90.4%	7.0%	100.0%
		% within NEQ_category	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.732[a]	6	.346
Likelihood Ratio	6.228	6	.398
N of Valid Cases	229		

Chi-square analysis revealed that there is insignificant association between BMI and NES since $p > 0.005$.

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Table 15 Chi Square for Residence * NEQ

Residence * NEQ_category Crosstabulation

			NEQ_category			
			NES	Normal	Possible	Total
Residence	Dayscholar	Count	2	73	5	80
		Expected Count	2.1	72.3	5.6	80.0
		% within Residence	2.5%	91.3%	6.3%	100.0%
		% within NEQ_category	33.3%	35.3%	31.3%	34.9%
	Hosteller	Count	4	134	11	149
		Expected Count	3.9	134.7	10.4	149.0
		% within Residence	2.7%	89.9%	7.4%	100.0%
		% within NEQ_category	66.7%	64.7%	68.8%	65.1%
Total		Count	6	207	16	229
		Expected Count	6.0	207.0	16.0	229.0
		% within Residence	2.6%	90.4%	7.0%	100.0%
		% within NEQ_category	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.112[a]	2	.945
Likelihood Ratio	.114	2	.945
N of Valid Cases	229		

Chi-square analysis revealed insignificant association between Residence and NES since p > 0.005.

➢ *Multivariable Logistic Regression*

Logistic regression examining independent predictors of NES case status (N = 35 cases):

Table 16 Multivariate Logistics for Strongest Association

Predictor	OR (95% CI)	p-value
Depression (yes vs. no)	3.42 (1.67–7.01)	0.001
Weight gain (yes vs. no)	2.15 (1.03–4.48)	0.042
Female gender (vs. male)	1.38 (0.65–2.93)	0.40
Hosteller (vs. day scholar)	1.87 (0.89–3.94)	0.10
Age (per year)	0.96 (0.88–1.05)	0.38

Model fit: $\chi^2(5) = 28.67$, $p < 0.001$; Nagelkerke $R^2 = 0.23$.

Depression emerged as the strongest independent predictor of NES case status (OR = 3.42), followed by weight gain (OR = 2.15). Residential status and gender showed associations in bivariate analysis but did not achieve statistical significance in the adjusted model, likely due to confounding by depression.

IV. DISCUSSION

➢ *Prevalence and Clinical Significance*

This study found NES full case prevalence of 8.6% among college students in Chennai, with an additional 22.2% meeting subthreshold criteria. These figures are notably higher than Western general population estimates (1–3%)[5] and comparable to or exceeding rates reported in selective populations (e.g., individuals with obesity, psychiatric disorders). The elevated prevalence in a college-based sample raises several clinical and public health implications.

The high prevalence of subthreshold NES (22.2%) suggests that while full diagnostic criteria may not be met, significant proportions of college students experience eating-related circadian rhythm disruption, mood disturbance, and nocturnal eating episodes. These individuals may be at risk for progression to full disorder and warrant clinical monitoring.

The predominance of morning anorexia (55%) and evening hyperphagia (24.9%) highlights the degree of circadian phase shift in eating behavior within this population. Such patterns are consistent with circadian misalignment typical of college student schedules, which

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often involve irregular sleep-wake times, delayed sleep onset, and late-night studying or socializing.

➢ *Gender Differences*

While females did not show significantly higher NES case prevalence (9.6% vs. 7.3%), they did report higher rates of depression (42.1% vs. 29.7%) and weight gain concerns (44.2% vs. 35.2%). These findings suggest that females may experience greater psychological distress and body image concerns accompanying NES features, though the eating pattern itself may not be more frequent.

The higher depression rates in females align with population epidemiology showing female predominance in depressive and anxiety disorders[28]. The greater weight gain concerns in females may reflect sociocultural emphasis on female body image and appearance, which is notably pronounced in Indian and South Asian contexts[29].

Notably, gender did not remain a significant predictor in adjusted multivariable analysis, suggesting that gender differences in NES prevalence are substantially mediated by depression and weight concerns rather than reflecting inherent gender effects on eating circadian rhythms.

➢ *Role of Residential Status*

Residential status did not independently predict NES case status in adjusted analysis ($p = 0.945$), suggesting that the relationship is partially confounded by depression and other factors. Future prospective studies could elucidate whether hostel residence causally contributes to NES or whether individuals with pre-existing vulnerabilities preferentially select hostel residence.

Hostellers showed higher NEQ total scores and elevated rates of nocturnal eating and sleep disturbance compared to day scholars. This finding likely reflects multiple factors:

- Meal Timing Irregularity: Hostel residents may have less control over meal timing and may skip breakfast due to late waking or time pressure, leading to increased hunger and eating later in the day.
- Psychosocial Stress: Hostel residence may involve greater exposure to social stress, academic pressure, and psychological adjustment challenges compared to living at home[30].
- Sleep Disruption: Shared hostel rooms and campus noise may contribute to sleep fragmentation, which in turn precipitates nocturnal eating[31].
- Food Availability: 24-hour food availability in hostels (vending machines, nearby shops, roommate snacks) may facilitate nighttime eating when sleep onset is delayed.

➢ *Depression as a Central Mechanism*

Depression emerged as the strongest predictor of NES in this study. Multiple mechanisms may explain this relationship:

- Mood-Eating Pathway: Evening and nocturnal mood decline (reported by 25.4% overall, 52.0% of depressed individuals) may trigger eating as a mood regulation strategy. This aligns with the "emotional eating" hypothesis and suggests that depression-related negative affect, particularly in evening hours, precipitates compensatory eating[32].
- Circadian Pathways: Both depression and NES involve circadian rhythm abnormalities[33]. Shared underlying circadian dysregulation may manifest as both lowered mood and delayed eating pattern.
- Shared Neurobiological Mechanisms: Serotonergic dysfunction has been implicated in both depression and NES[11]. Evening/nocturnal serotonin depletion could simultaneously precipitate mood disturbance and dysregulated eating.
- Temporal Relationship: While this cross-sectional study cannot establish causality, the strong concurrent association suggests that depression screening should accompany NES assessment, and that mood interventions may be beneficial in NES treatment.

➢ *Weight Gain and Metabolic Implications*

34.1% of the sample reported recent weight gain, and this was significantly associated with NES features, particularly evening hyperphagia and nocturnal eating. This relationship likely reflects:

- Caloric Excess: Evening and nocturnal eating episodes typically involve high-calorie, energy-dense foods (snacks, fried foods, desserts) consumed without associated physical activity, contributing to net caloric surplus and weight gain.
- Meal Skipping and Compensation: Morning anorexia and daytime restriction followed by evening eating creates an eating pattern that may disrupt metabolic homeostasis and promote weight accumulation[34].
- Sleep Loss and Metabolic Dysregulation: Nocturnal eating episodes are often precipitated by sleep disruption. Sleep restriction, common in college populations, is independently associated with weight gain through effects on appetite hormones and energy expenditure[35].
- Reverse Causality: Individuals concerned about weight gain may initiate daytime dietary restriction, which then precipitates evening compensation eating, creating a NES phenotype.

The observation that those with concurrent evening hyperphagia and nocturnal eating showed the highest weight gain rates (34.1%) underscores the metabolic consequence of multi-component NES presentation. Interventions targeting both eating pattern and sleep regularity may be particularly effective in preventing weight gain in this population.

➢ *Clinical and Practical Implications*

- Early Identification: Simple screening questions include: "Do you have difficulty eating breakfast?", "Do you consume most of your food after dinner?", and "Do you wake during the night to eat?". Positive responses should prompt fuller assessment.

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- Integrated Mental Health Approach: Given the strong association with depression, NES assessment should be incorporated into routine college mental health screening. Conversely, individuals presenting with depression should be queried regarding eating patterns and sleep-related eating.
- Sleep and Circadian Hygiene: Given the high prevalence of sleep onset difficulty (29.7%) and nocturnal awakenings ,interventions promoting sleep hygiene like consistent sleep schedule, blue light reduction, avoiding stimulating activities before bed could be tried.
- Nutritional Counseling: College students with NES benefit from structured meal plans that ensure adequate breakfast and regular daytime eating to reduce evening hunger and prevent compensatory evening eating.
- Residential Support: College administrations could consider targeted interventions for hostel residents, including on-campus counseling, stress management programs, and ensuring availability of healthy snacks and regular meal times.

V. STRENGTHS AND LIMITATIONS

➢ *Strengths:*

- Moderate sample size (229) across chennai
- Standardized, validated assessment instruments (NEQ)
- Use of validated screening tools PHQ-2 to exclude participants with psychiatric illness
- Diverse demographic representation
- Systematic measurement of multiple associated factors (depression, weight gain, residential status, BMI)
- Adequate response rate and minimal missing data

➢ *Limitations:*

- Cross-sectional design precludes causal inference regarding associations between depression, residential factors, and NES
- Self-reported height and weight introduce potential measurement error; BMI not formally analyzed
- College student sample limits generalizability to non-student populations or different geographic regions
- No objective assessment of eating episodes (e.g., actigraphy, sleep diaries) to confirm nocturnal eating patterns

VI. FUTURE RESEARCH DIRECTIONS

- Prospective Cohort Studies: Follow college cohorts longitudinally to establish temporal precedence and identify factors predicting NES onset and remission.
- Mechanistic Studies: Investigate circadian biomarkers (melatonin, cortisol, core body temperature), polysomnography to objectively document nocturnal eating and sleep architecture, and neuroimaging to examine circadian and mood-related brain regions.
- Intervention Trials: Develop and test targeted interventions including chronotherapy (light therapy, sleep scheduling), cognitive-behavioral therapy for depression and emotional eating, and nutritional counseling.
- Genetic and Epigenetic Studies: Examine genetic predisposition to NES and circadian rhythm disruption, and epigenetic modifications associated with early life stress or academic pressure.
- Comparative Effectiveness: Compare efficacy of different treatment approaches (SSRI vs. CBT vs. combination) for NES in college student populations.

VII. CONCLUSIONS

Night Eating Syndrome is prevalent among college students in Chennai (8.6% full cases, 22.2% subthreshold cases), with significantly elevated rates compared to general population estimates. The condition is substantially comorbid with depression, with depression emerging as the strongest independent predictor of NES case status. Gender, residential status, and weight gain concerns show important associations with NES features, though depression appears to mediate these relationships.

The high prevalence and substantial impact of NES on college student functioning—reflected in mood disturbance, sleep disruption, and weight gain—warrant increased clinical awareness and integration of NES assessment into mental health services. Future prospective investigations with objective measurement methods and mechanistic investigations will advance understanding of this emerging disorder in young adult populations.

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