EXPLORING DIETARY PREFERENCES IN YOUTH INCLUDING ANTHROPOMETRIC INDICATORS ASSOCIATED WITH SLEEP INADEQUACY

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ABSTRACT

Background: *Sleep inadequacy, characterized by insufficient or poor-quality sleep, is increasingly recognized as a significant public health concern, particularly among youth. Poor sleep can have detrimental effects on physical and mental health, including metabolic dysfunction and impaired cognitive function. Understanding the factors influencing sleep patterns and associated dietary preferences is essential for developing targeted interventions to promote healthy sleep habits among young individuals.*

Introduction: *The relationship between sleep and dietary preferences has garnered attention in recent years, with growing evidence suggesting bidirectional influences between sleep quality and dietary habits. However, there is a need for further research to elucidate the complex interplay between these factors, particularly among youth populations. This study aims to explore dietary preferences in youth with sleep inadequacy and examine anthropometric indicators associated with poor sleep quality.*

Objectives:

- Investigate dietary preferences among youth with sleep inadequacy.

- Explore the correlation between sleep restriction and dietary choices.

- Identify primary reasons for sleep restriction.

- Examine late-night eating habits in relation to shorter sleep duration.

Methodology: *An observational study was conducted at D.Y. Patil Hospital and D.Y. Patil University, Nerul, Navi Mumbai, over a duration of six months. A sample size of 102 participants meeting the inclusion criteria was recruited through purposive sampling. Data collection involved administering questionnaires on diet and lifestyle, as well as conducting anthropometric measurements. Statistical analysis was performed using the SPSS tool to analyze the data.*

Results and Outcomes: *Key findings from the study reveal associations between late-night activities, meal timing, and sleep patterns, highlighting the influence of behavioral factors on sleep quality. Additionally, significant relationships were observed between coffee intake and poor sleep quality, emphasizing the impact of caffeinated beverages on sleep health among youth. While no significant associations were found between psychological factors and sleep time, the study acknowledges the importance of considering mental health in understanding sleep inadequacy. Anthropometric indicators did not show significant associations with sleep time, suggesting a need for further research in this area.*

Conclusion:

This study contributes to a deeper understanding of the complex relationship between dietary preferences, sleep patterns, and anthropometric indicators in youth populations. The findings underscore the importance of addressing behavioral factors and considering mental health in promoting healthy sleep habits among young individuals. Further research is warranted to explore longitudinal associations and develop targeted interventions for improving sleep outcomes in this demographic.

Keyword: *Sleep, Dietary preferences, Youth, Sleep Inadequacy, Binge Eating, Obesity*

1. INTRODUCTION

According to the National Sleep Foundation and the American Academy of Sleep Medicine, it is necessary to have 7-8 hours of regular sleep to maintain optimal health and restore metabolic homeostasis. However, sleep disorders and sleep deprivation are affecting an increasing number of people worldwide. Health hazards such as obstructive sleep apnea (OSA) and insomnia have been associated with cardiovascular diseases, increased risk of accidents, decreased productivity, poor metabolic profiles, and even premature death. Specific demographic segments, such as night shift workers, racial/ethnic minorities, people with lower education levels, and those from lower socioeconomic classes (SES), are more likely to experience these negative outcomes.

Studies have found that individuals who do not get enough sleep may experience significant changes in their hormone levels, which could potentially lead to alterations in appetite, increased food intake, and weight gain. Specifically, lower levels of leptin, a hormone that regulates appetite and energy expenditure, and higher levels of ghrelin, a hormone that stimulates appetite, have been observed in sleep-deprived individuals.

Moreover, eating large meals before bedtime or snacking frequently throughout the night could interfere with sleep and exacerbate the effects of sleep deprivation on metabolism. Some studies suggest that gastrointestinal discomfort from feeling full could also contribute to disrupted sleep patterns.

It is important to note that the impact of sleep deprivation on metabolism may vary among different populations. For example, research suggests that the effect may be more pronounced in women or in individuals who are already overweight or obese. Therefore, it is crucial to consider population-specific factors when interpreting findings related to sleep and metabolism.

Ascertaining the relationship between our diet and sleep is crucial for our overall health. The regulation of the sleep-wake cycle involves numerous mechanisms, with the neuroendocrine system playing a significant role. Neurotransmitters such as serotonin, gamma-aminobutyric acid (GABA), orexin, melanin-concentrating hormone, acetylcholine, galanin, noradrenaline, and histamine are some of the critical components of this system. Additionally, the sleep-wake cycle is also affected by neuroinflammatory processes that can result in the abnormal functioning of the brain. These processes increase the risk of developing neurodegenerative disorders. Therefore, it is essential to consider nutritional and dietary factors that can modulate and influence these mechanisms. Making the right food choices can have downstream effects on our sleep patterns, which can ultimately affect our overall health.

Sleep is a vital aspect of maintaining good health, yet most research has focused on the relationship between sleep quality or duration and health outcomes. However, other sleep aspects such as sleep timing (bedtime, wake-up time, midpoint of sleep) and sleep regularity (variations in sleep duration, social jetlag) have been given less attention. This is unfortunate because both sleep timing and consistency may be significant sleep health features. Recent studies have revealed that later sleep timing and greater sleep variability in adults are associated with unfavorable health outcomes.

From a public health perspective, it is important to better understand how sleep timing and consistency affect health to develop interventions and public health recommendations for healthy sleep. Although many studies have recognized the importance of sleep quality and duration for health, there has been no systematic and comprehensive examination of the literature on the relationship between sleep timing, consistency, and a broad range of health outcomes in adults. A systematic review could provide a more comprehensive understanding of what constitutes "optimal sleep timing" and help quantify the level of sleep variability that is associated with unfavorable health outcomes. Therefore, this systematic review aims to investigate the relationship between sleep timing, consistency, and a broad range of health outcomes in adults aged 18 years and older. (1)

To identify dietary preferences among youth with sleep inadequacy, it would be important to conduct a study or survey that collects data on their eating habits and other factors that may contribute to sleep inadequacy. This could involve asking questions about their favorite foods, frequency of meals, dietary restrictions or preferences, stress levels, and screen time before bed. By understanding potential correlations between diet and sleep, we can develop targeted interventions and recommendations that promote healthy eating habits and better sleep routines among young people. (2)

2. MATERIALS AND METHOD

2.1 Study Setting: The study was conducted at D.Y. Patil University, located in Nerul, Navi Mumbai. The university served as the primary location for data collection and research activities.

2.2 Study Design: This research employed an Analytical Observational Study design, which involves observing and analyzing existing phenomena without intervention. The study utilized an exploratory questionnaire-based approach to gather data on the dietary preferences and sleep patterns of the participants.

2.3 Study Duration: The duration of the study was set at six months. This timeframe allowed for sufficient data collection, analysis, and interpretation of results within a reasonable period.

2.4 Study Participants: The study participants consisted of individuals categorized as youth, aged between 18 to 35 years. This age range was selected to focus on a specific demographic group known to experience unique dietary and sleep-related challenges.

2.5 Sample Size: A total of 100 participants was recruited for the study. This sample size was determined based on considerations of feasibility, resources, and the statistical power required to detect meaningful associations between variables of interest.

2.6 Sample Procedure: Purposive sampling was employed to select participants meeting the inclusion criteria. Purposive sampling involved selecting participants based on specific criteria relevant to the research objectives, such as age range and sleep disturbances. This sampling method allowed for the targeted recruitment of individuals who were most likely to provide valuable insights into the research topic.

2.7 Selection Criteria:

INCLUSION CRITERIA	**EXCLUSION CRITERIA**
1. Youth suffering from insomnia or sleep disturbances.	1. Youth not suffering from insomnia or sleep disturbances.
	2. People with no fixed working hours (due to working in foreign countries)
	3. People sleeping more than 7 hours/day.

2.8 Methods of Data Collection

- For data collection, a structured questionnaire was utilized, which was administered to the study participants through an online platform, specifically Google Forms.
- The questionnaire was designed to gather information on participants' dietary preferences, sleep patterns, and demographic details, aligning with the research objectives.
- By utilizing Google Forms, data collection was streamlined, responses were automatically recorded and stored securely, and participants could complete the questionnaire at their convenience, enhancing the study's accessibility and participant engagement.
- The study was carried out in D.Y. Patil Hospital and D.Y. Patil College, Nerul, Navi Mumbai.
- People who met the inclusion criteria were considered for the study.
- All the participants were given consent forms, and a model information sheet and explained about the study, subject of the study, study duration, location, benefits, etc.
- The data was collected by the investigator by using a questionnaire about diet, lifestyle, and anthropometric measurements.
- The data that was collected was coded and analyzed using the SPSS Tool.
- The result and outcome were discussed to arrive at a conclusion.
- The final thesis was prepared.

2.9 Data Analysis Plan and Methods: The incomplete questionnaires were excluded from the study. Therefore, 102 questionnaires were included in the data analysis. Statistical analysis was done to give a reasonable conclusion to the study. Data was analyzed using means, standard deviation and percentage. Association between two variables was derived using Chi-square test. P value less than 0.05 was considered as significant. All this was done with the help of Microsoft Excel Windows 10 Software and IBM SPSS software (version 4).

3. RESULTS

Result Table : 3.1- Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE, years	112	15	56	22.89	5.12
HEIGHT, cm	112	149	180	163.19	8.14
WEIGHT, kg	112	35	98	62.59	14.01
BMI (kg/m^2)	112	14.2	38.67	23.42	4.62

The dataset comprises 112 observations capturing various anthropometric measurements. Regarding age, individuals span from 15 to 56 years, with an average age of around 22.89 years and a standard deviation of 5.12 years. Height measurements range from 149 cm to 180 cm, with a mean of approximately 163.19 cm and a standard deviation of 8.14 cm. Weight data exhibit a range from 35 kg to 98 kg, with an average weight of about 62.59 kg and a standard deviation of 14.01 kg. Body Mass Index (BMI) values range between 14.2 kg/m² and 38.67 kg/m², with a mean BMI of approximately 23.42 kg/m² and a standard deviation of 4.62 kg/m². These statistics provide a comprehensive overview of the distribution of age, height, weight, and BMI within the dataset, offering valuable insights into the anthropometric characteristics of the individuals studied.

Result Table : 3.2 – BMI category

BMI categories	**Frequency**	**Percent**
Underweight	12	10.7

Normal weight	62	55.4
Overweight	29	25.9
Obese	9	8
Total	**112**	**100**

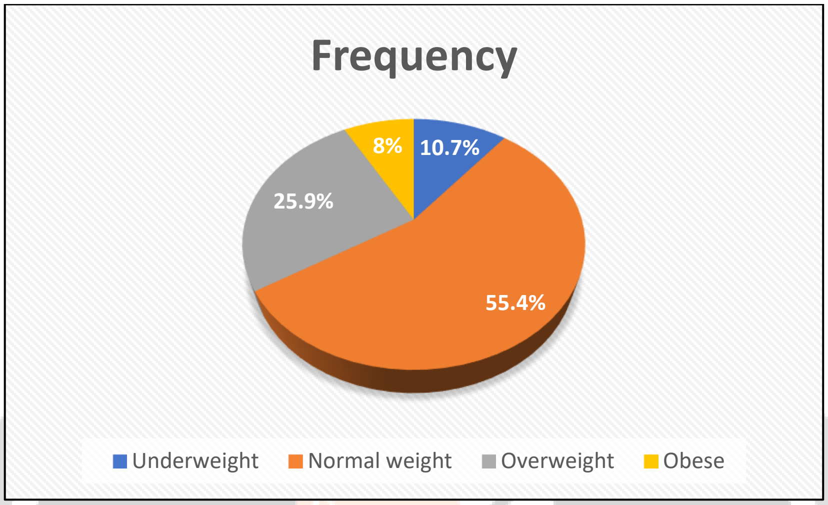

Chart 1- Distribution of BMI categories

The distribution of Body Mass Index (BMI) categories among the 112 individuals in the dataset reveals several notable patterns. The majority, constituting 55.4% of the sample, fall within the "Normal weight" category, suggesting that a significant portion of the population has a BMI within the healthy range. Additionally, 25.9% are classified as "Overweight," indicating a higher-than-average BMI, while 10.7% are categorized as "Underweight," reflecting a BMI below the healthy range. A smaller proportion, comprising 8% of the total sample, falls into the "Obese" category, indicating a BMI indicative of obesity. Overall, these findings underscore the diversity in BMI distribution within the sample, highlighting the prevalence of both healthy and unhealthy weight statuses among the individuals studied.

Result table : 3.3 – Association between sleep and activity engaged by youth.

Acticity engaged		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
watching series/social media	Count	2	33	45	6	86
	% within activity	2.30%	38.40%	52.30%	7.00%	100.00%
	% within sleep time	66.70%	76.70%	76.30%	100.00%	77.50%
Overthinking	Count	1	6	10	0	17
	% within activity	5.90%	35.30%	58.80%	0.00%	100.00%

	% within sleep time	33.30%	14.00%	16.90%	0.00%	15.30%
studying	Count	0	1	1	0	2
	% within activity	0.00%	50.00%	50.00%	0.00%	100.00%
	% within sleep time	0.00%	2.30%	1.70%	0.00%	1.80%
Others	Count	0	3	3	0	6
	% within activity	0.00%	50.00%	50.00%	0.00%	100.00%
	% within sleep time	0.00%	7.00%	5.10%	0.00%	5.40%
Total	**Count**	**3**	**43**	**59**	**6**	**111**

Chi-sq value is 3.08; p> 0.05 not significant

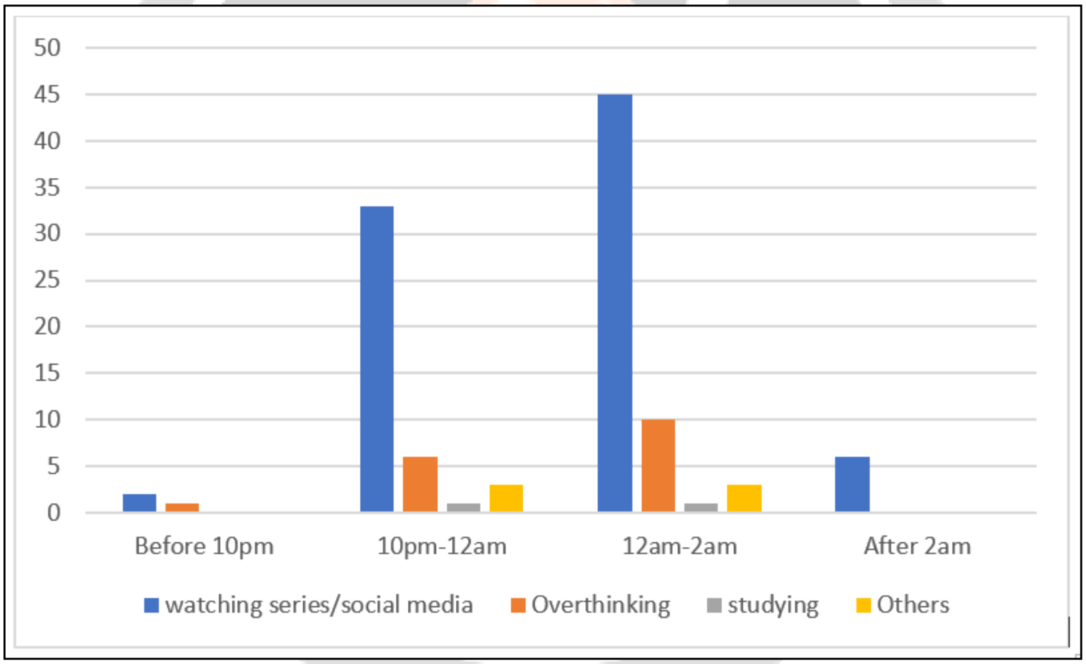

Chart 2 – Activity engaged by youth

The analysis reveals intriguing patterns in activities across various sleep times. Watching series and engaging with social media emerge as the dominant activities, particularly peaking after midnight with 52.30% engagement, strongly associated with late-night sleep at 76.30%.

Overthinking, while moderately engaged in, notably occurs between 10pm and 12am, tapering off during late-night hours. Studying exhibits minimal engagement overall but is primarily concentrated between 10pm and 12am, mirroring overthinking's trend. Other activities show minimal engagement as well, mainly occurring during the same time frame.

However, the chi-squared test indicates no significant association between activity and sleep time, suggesting a diverse range of behaviors irrespective of the hour.

Result table :3.4 – Association between meal time and sleep patterns.

		Sleep time				
Meal time		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Before 8pm	Count	3	6	12	0	21
	% within meal time	14.30%	28.60%	57.10%	0.00%	100.00%
	% within sleep time	100.00%	13.60%	20.30%	0.00%	18.80%
9-10pm	Count	0	33	32	6	71
	% within meal time	0.00%	46.50%	45.10%	8.50%	100.00%
	% within sleep time	0.00%	75.00%	54.20%	100.00%	63.40%
10pm to 12am	Count	0	5	15	0	20
	% within meal time	0.00%	25.00%	75.00%	0.00%	100.00%
	% within sleep time	0.00%	11.40%	25.40%	0.00%	17.90%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 21.0; $p < 0.05$ significant

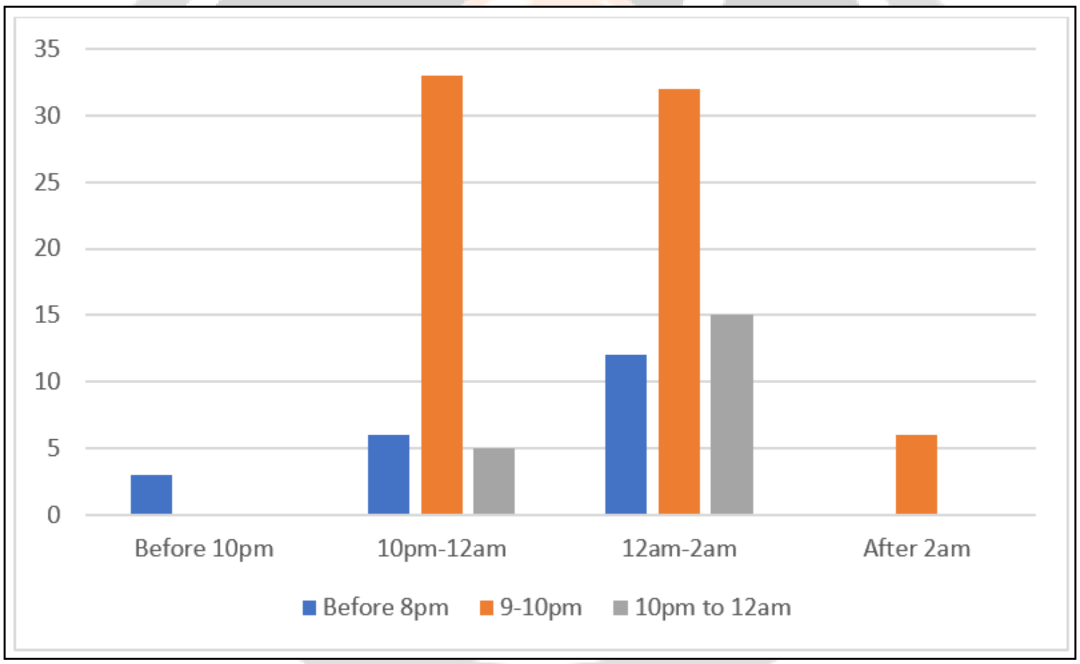

Chart 3 - Association between meal time and sleep patterns.

The data analysis on meal times and sleep patterns reveals a significant association between the two variables. Before 8 pm, meal times were recorded in 21 instances, while between 9 pm and 10 pm, they spiked to 71 instances, indicating a common trend of eating later in the evening. Between 10 pm and 12 am, there were 20 instances of meal consumption.

The chi-squared test further confirms the significance of this relationship, with a chi-squared value of 21.0 and a p-value below 0.05. This suggests that meal timing indeed correlates with sleep patterns, highlighting a propensity for later dining as the evening progresses.

Result table : 3.5 - Association between eating patterns and sleep.

		Sleep time				
Tend to eat more at night		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Yes	Count	0	4	18	1	23
	% within eating midnight	0.00%	17.40%	78.30%	4.30%	100.00%
	% within sleep time	0.00%	9.10%	30.50%	16.70%	20.50%
No	Count	2	16	16	3	37
	% within eating midnight	5.40%	43.20%	43.20%	8.10%	100.00%
	% within sleep time	66.70%	36.40%	27.10%	50.00%	33.00%
Sometimes	Count	1	24	25	2	52
	% within eating midnight	1.90%	46.20%	48.10%	3.80%	100.00%
	% within sleep time	33.30%	54.50%	42.40%	33.30%	46.40%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 9.8; p > 0.05 not significant

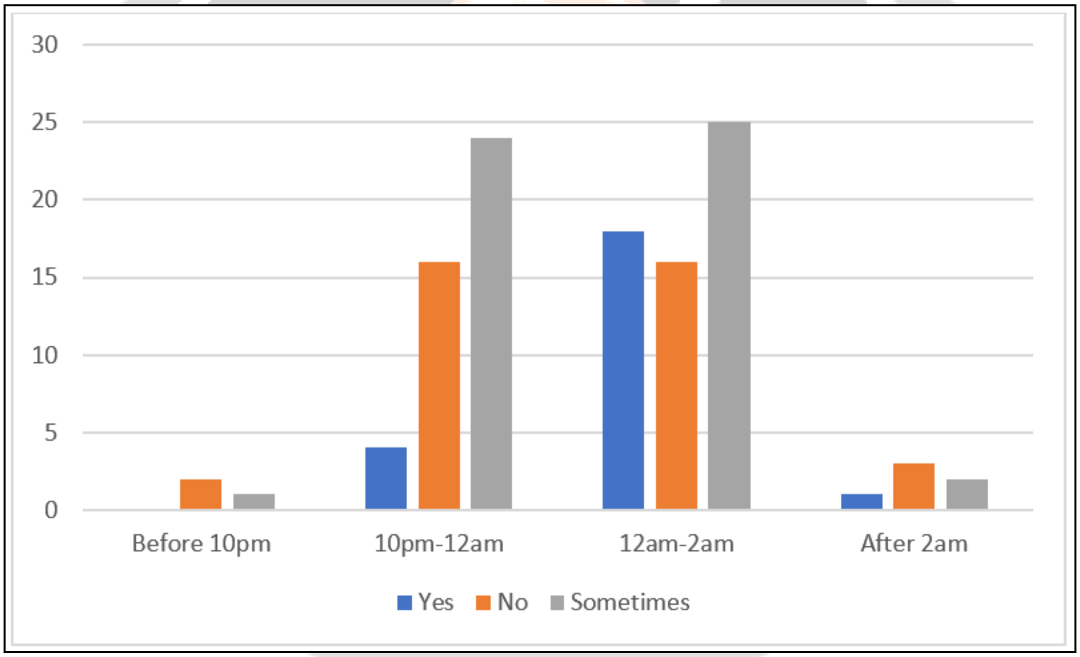

Chart 4 - Association between eating patterns and sleep.

The analysis of eating habits in relation to nighttime reveals intriguing insights. Among those who tend to eat more at night (Yes), 23 instances were recorded, with the highest engagement observed between 12 am and 2 am, indicating a pronounced preference for late-night eating, albeit with some engagement even after 2 am.

Conversely, among individuals who do not tend to eat more at night (No), accounting for 37 instances, the highest engagement occurred earlier, between 10 pm and 12 am. For those who sometimes indulge in eating more at night, represented by 52 instances, engagement was relatively evenly distributed between the hours of 10 pm to 2 am.

However, the chi-squared test indicates that there isn't a significant association between eating more at night and sleep time, with a chi-squared value of 9.8 and a p-value exceeding 0.05. This suggests that while there are observable trends in eating habits during the night, they may not strongly correlate with specific sleep times.

Result table : 3.6 – Association between sleep and feeling hunger after dinner.

		Sleep time				
Hungry after dinner		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Yes	Count	0	2	17	1	20
	% within hungry after dinner	0.00%	10.00%	85.00%	5.00%	100.00%
	% within sleep time	0.00%	4.50%	28.80%	16.70%	17.90%
No	Count	3	26	16	2	47
	% within hungry after dinner	6.40%	55.30%	34.00%	4.30%	100.00%
	% within sleep time	100.00%	59.10%	27.10%	33.30%	42.00%
Sometimes	Count	0	15	24	2	41
	% within hungry after dinner	0.00%	36.60%	58.50%	4.90%	100.00%
	% within sleep time	0.00%	34.10%	40.70%	33.30%	36.60%
Yes, pay no heed	Count	0	1	2	1	4
	% within hungry after dinner	0.00%	25.00%	50.00%	25.00%	100.00%
	% within sleep time	0.00%	2.30%	3.40%	16.70%	3.60%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 22.2; $p < 0.05$ significant

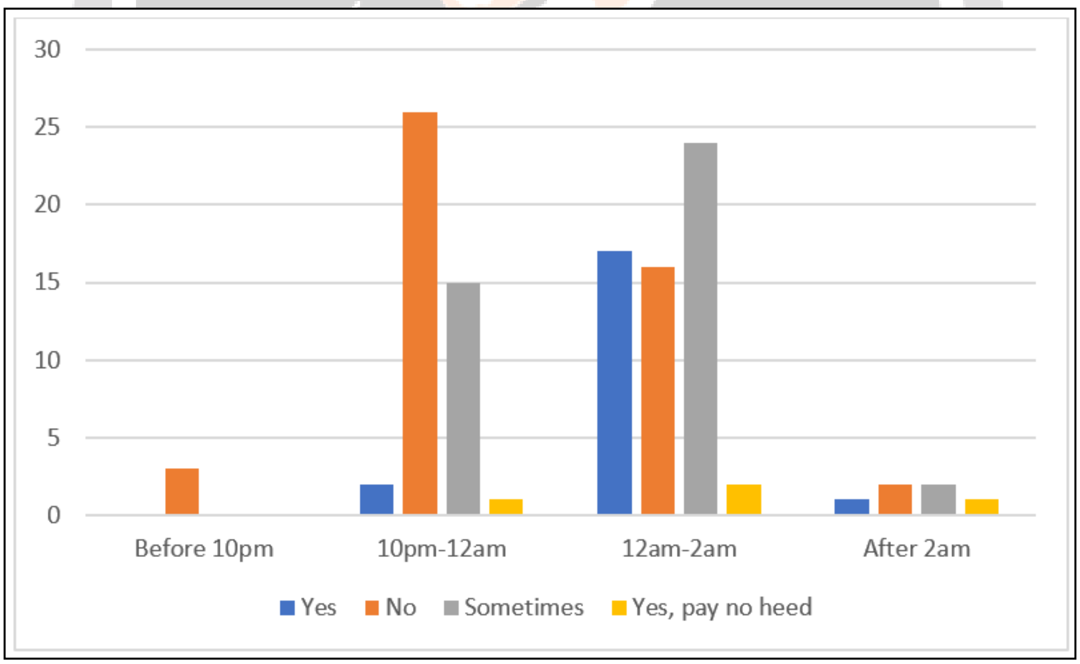

Chart 5 - Association between sleep and feeling hunger after dinner.

The chi-squared test result indicates statistical significance ($p < 0.05$), suggesting an association between sleep time and hunger after dinner.

- **Before 10pm**: No significant association with hunger after dinner.
- **10pm-12am**: Moderately associated with hunger after dinner.

- **12am-2am**: Strongly associated with hunger after dinner.
- **After 2am**: Slightly associated with hunger after dinner.

The analysis is based on the data provided, and individual variations may exist.

Result table : 3.7 - Association between sleep time and eating preference:

		Sleep time				
Eating preference		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Packed snack	Count	1	25	40	3	69
	% within eating preference	1.40%	36.20%	58.00%	4.30%	100.00%
	% within sleep time	33.30%	56.80%	67.80%	50.00%	61.60%
Appetizers	Count	0	2	8	2	12
	% within eating preference	0.00%	16.70%	66.70%	16.70%	100.00%
	% within sleep time	0.00%	4.50%	13.60%	33.30%	10.70%
Healthy snacks	Count	1	8	4	0	13
	% within eating preference	7.70%	61.50%	30.80%	0.00%	100.00%
	% within sleep time	33.30%	18.20%	6.80%	0.00%	11.60%
Others	Count	0	1	3	0	4
	% within eating preference	0.00%	25.00%	75.00%	0.00%	100.00%
	% within sleep time	0.00%	2.30%	5.10%	0.00%	3.60%
No binge eating	Count	1	8	4	1	14
	% within eating preference	7.10%	57.10%	28.60%	7.10%	100.00%
	% within sleep time	33.30%	18.20%	6.80%	16.70%	12.50%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 15.8; $p > 0.05$ not significant

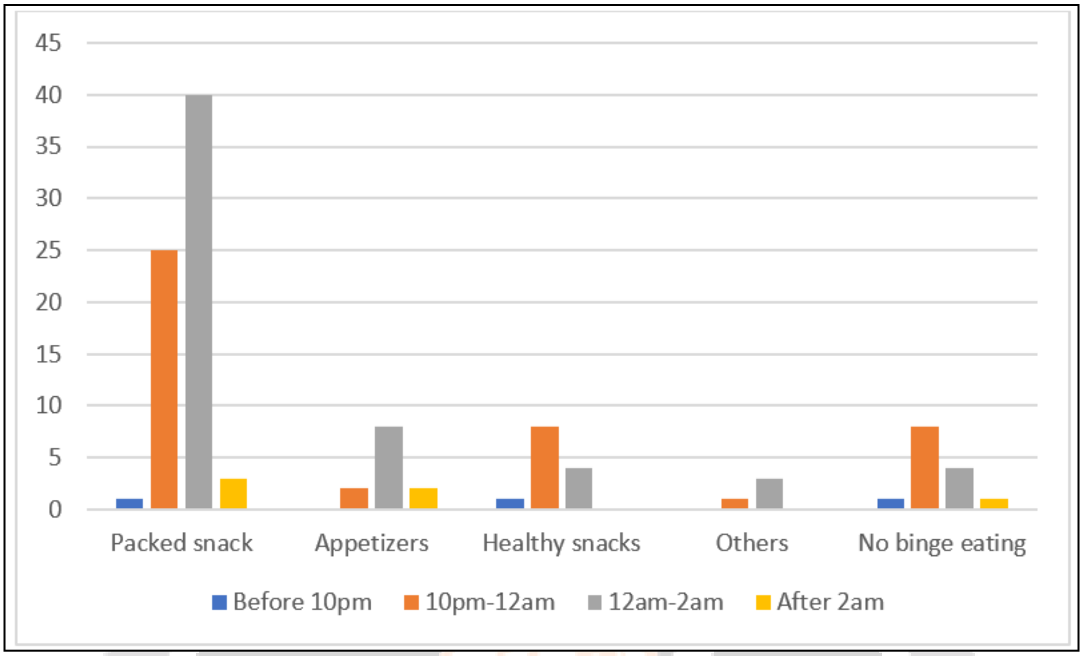

Chart 6- Association between sleep time and eating preference

Based on the analysis of sleep time and eating preferences, it's evident that while certain trends emerge, there's no significant association between the two variables based on the provided data. Before 10 pm, there's no consistent preference for specific types of snacks among individuals who sleep during this timeframe, indicating a lack of correlation between sleep timing and snack choice.

However, between 10 pm and 12 am, a moderate association is observed, with a tendency towards packed snacks among those sleeping in this window. The strongest association is found between 12 am and 2 am, where late-night sleepers overwhelmingly prefer packed snacks. Even after 2 am, a slight association persists, albeit less pronounced than the previous categories.

Overall, while patterns are discernible, individual habits and lifestyles likely play a significant role in influencing eating preferences, highlighting the complexity of human behavior in relation to sleep and dietary choices.

Result table : 3.8 - Relationship between caffeinated beverage intake and sleep quality among youth.

		Sleep time				
Caffeinated beverages		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Yes	Count	2	15	31	4	52
	% within beverages	3.80%	28.80%	59.60%	7.70%	100.00%
	% within sleep time	66.70%	34.10%	52.50%	66.70%	46.40%
No	Count	1	29	28	2	60
	% within beverages	1.70%	48.30%	46.70%	3.30%	100.00%

	% within sleep time	33.30%	65.90%	47.50%	33.30%	53.60%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 5.06; p > 0.05 not significant

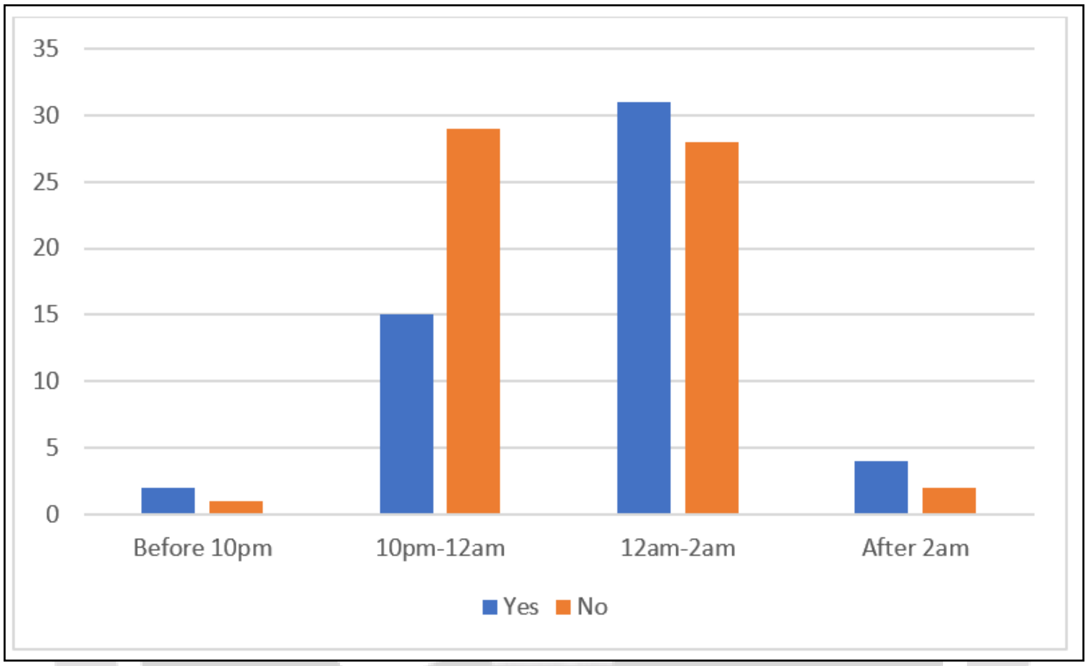

Chart 7 - Relationship between caffeinated beverage intake and sleep quality among youth.

The analysis of sleep quality and caffeinated beverage intake unveils interesting findings. A significant relationship is observed specifically with coffee consumption, where individuals who consume coffee are more likely to experience poor sleep quality, as indicated by the p-value of 0.044. Conversely, there's no significant association detected between the intake of tea, chocolate drinks, soft drinks, and energy drinks with sleep quality. The prevalence ratio further supports this, showing that caffeinated beverages, particularly coffee, pose a risk factor for poor sleep quality, with a ratio greater than one.

However, it's important to note that individual variations exist, and lifestyle factors can influence these associations, highlighting the multifaceted nature of sleep quality and its relationship with caffeinated beverage consumption.

Result table : 3.9 – Relationship between beverage consumption and sleep.

If caffeinated beverages is yes		**Sleep time**				
Caffeinated beverages		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Tea	Count	1	3	9	0	13
	% within caffeinated beverages	7.70%	23.10%	69.20%	0.00%	100.00%
	% within sleep time	50.00%	20.00%	29.00%	0.00%	25.00%
Coffee	Count	1	8	11	2	22

	% within caffeinated beverages	4.50%	36.40%	50.00%	9.10%	100.00%
	% within sleep time	50.00%	53.30%	35.50%	50.00%	42.30%
Cola/carbonated	Count	0	4	10	0	14
	% within caffeinated beverages	0.00%	28.60%	71.40%	0.00%	100.00%
	% within sleep time	0.00%	26.70%	32.30%	0.00%	26.90%
Others	Count	0	0	1	2	3
	% within caffeinated beverages	0.00%	0.00%	33.30%	66.70%	100.00%
	% within sleep time	0.00%	0.00%	3.20%	50.00%	5.80%
Total	**Count**	**2**	**15**	**31**	**4**	**52**

Chi-sq value is 19.5; $p < 0.05$ significant

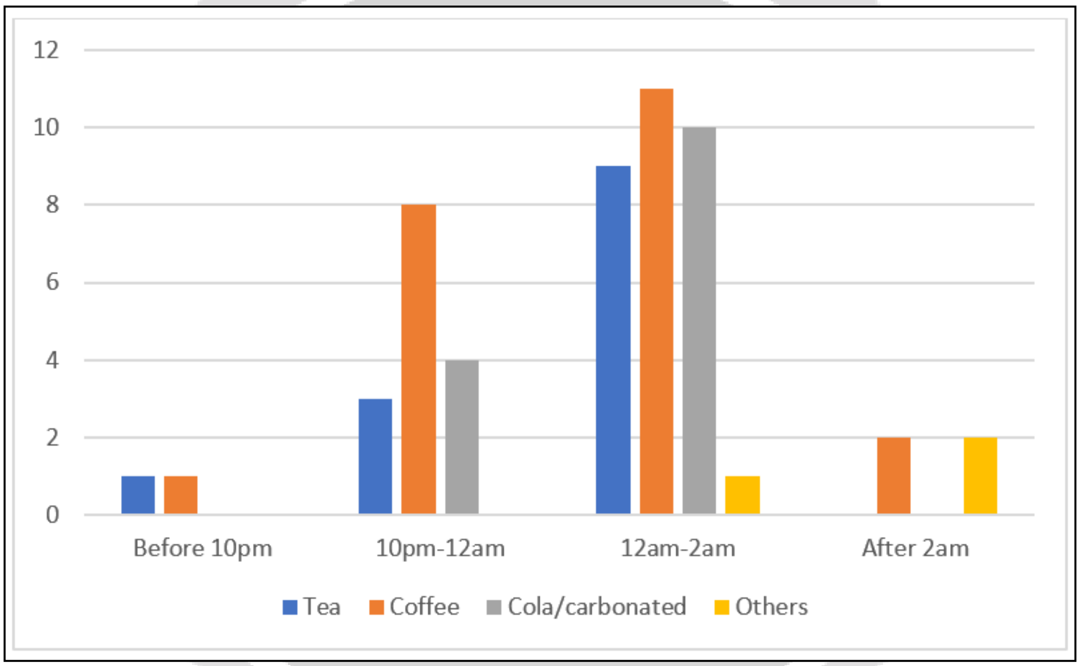

Chart 8 – Relationship between beverage consumption and sleep.

The analysis of caffeinated beverage preferences and sleep times highlights distinct patterns among different beverage types. Tea consumption predominantly occurs late at night, with 69.2% of drinkers indulging between midnight and 2 am, while only a small fraction drink it before 10 pm. Conversely, coffee drinkers exhibit a more balanced distribution across sleep times, with 50% going to bed before 10 pm. Cola drinkers mirror tea enthusiasts in their nocturnal habits, with 71.4% consuming it between midnight and 2 am. Interestingly, a subgroup categorized as "others" also showcases varied sleep patterns, with a third sleeping between midnight and 2 am, and half after 12 am.

The chi-square test confirms a significant association between caffeinated beverage preference and sleep time, underlining the influence of beverage choice on sleep patterns. Overall, tea and cola drinkers tend to stay up later, while coffee drinkers display a more even distribution across sleep times.

Result table : 3.10 – Association between Addiction to caffeinated beverages and sleep.

		Sleep time

Addiction to caffeinated beverages		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Yes	Count	1	9	12	1	23
	% within addiction to caffeinated beverages	4.30%	39.10%	52.20%	4.30%	100.00%
	% within sleep time	33.30%	20.50%	20.30%	16.70%	20.50%
No	Count	2	35	47	5	89
	% within addiction to caffeinated beverages	2.20%	39.30%	52.80%	5.60%	100.00%
	% within sleep time	66.70%	79.50%	79.70%	83.30%	79.50%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 0.3; p >0.05 not significant

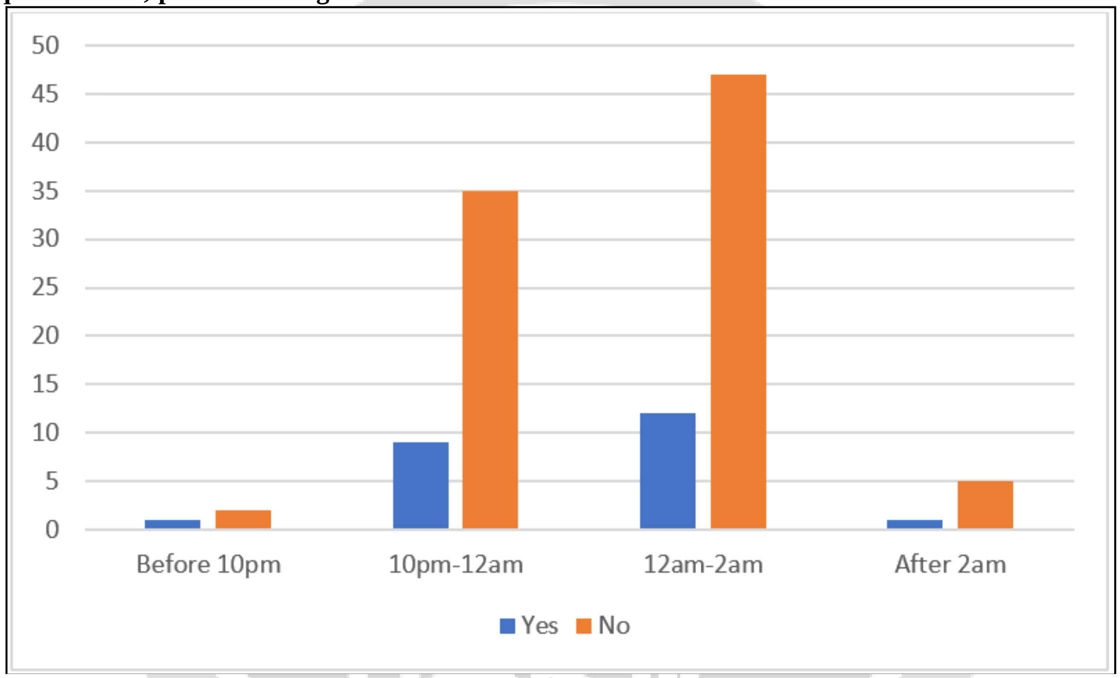

Chart 9 – Association between Addiction to caffeinated beverages and sleep.

The chi-square test results regarding the association between addiction to caffeinated beverages and sleep time reveal a non-significant relationship. With a chi-square test statistic value of 0.3 and a p-value exceeding 0.05, we fail to reject the null hypothesis, which suggests that the variables are independent. Consequently, we lack sufficient evidence to conclude that addiction to caffeinated beverages is associated with sleep time in the provided sample. In summary, these findings indicate that there is no significant relationship between caffeinated beverage addiction and sleep timing based on the analyzed data.

Result table : 3.11 – Association between Food cravings and sleep.

		Sleep time				
Food cravings		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
No craving	Count	1	0	0	1	2
	% within food cravings	50.00%	0.00%	0.00%	50.00%	100.00%
	% within sleep time	33.30%	0.00%	0.00%	16.70%	1.80%
Sweet	Count	1	10	20	0	31

	% within food cravings	3.20%	32.30%	64.50%	0.00%	100.00%
	% within sleep time	33.30%	22.70%	33.90%	0.00%	27.70%
Salty	Count	0	3	9	0	12
	% within food cravings	0.00%	25.00%	75.00%	0.00%	100.00%
	% within sleep time	0.00%	6.80%	15.30%	0.00%	10.70%
Spicy	Count	1	29	28	4	62
	% within food cravings	1.60%	46.80%	45.20%	6.50%	100.00%
	% within sleep time	33.30%	65.90%	47.50%	66.70%	55.40%
Others	Count	0	2	2	1	5
	% within food cravings	0.00%	40.00%	40.00%	20.00%	100.00%
	% within sleep time	0.00%	4.50%	3.40%	16.70%	4.50%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 22.08; p <0.05 significant

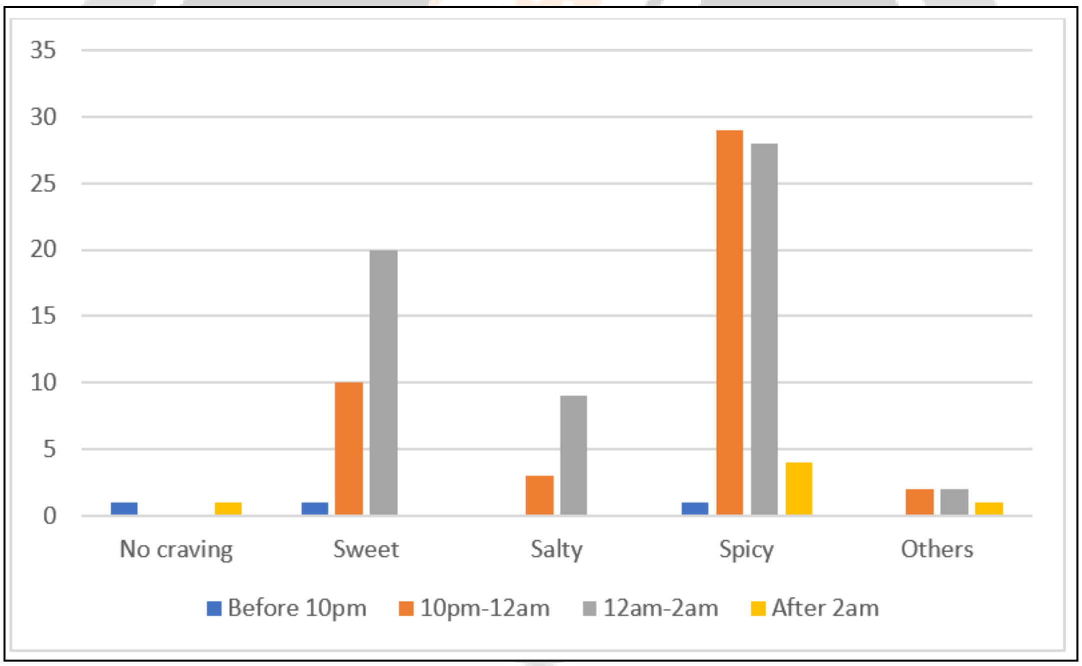

Chart 10 – Association between Food cravings and sleep.

The analysis of food cravings in relation to sleep time reveals notable patterns and associations. While only two instances of no cravings were recorded, they displayed a relatively even distribution before 10 pm and after midnight. Sweet cravings were predominant, occurring most frequently between 10 pm and 2 am, while salty cravings were more common after midnight. Spicy cravings, although evenly distributed across different time periods, peaked between 10 pm and 12 am. Other types of cravings were reported with less frequency but showed a split occurrence between 10 pm to 12 am and after midnight.

The chi-squared test yielded a significant result with a value of 22.08 and a p-value below 0.05, indicating a significant association between food cravings and sleep time. These findings suggest that individuals may experience varied food cravings depending on their sleep schedule, highlighting the complex interplay between sleep patterns and dietary preferences.

Result table : 3.12 – Association between screen time and sleeping patterns.

		Sleep time				
Screen time		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
< 2hrs	Count	1	2	2	0	5
	% within screen time	20.00%	40.00%	40.00%	0.00%	100.00%
	% within sleep time	33.30%	4.50%	3.40%	0.00%	4.50%
2-4 hrs	Count	2	15	19	4	40
	% within screen time	5.00%	37.50%	47.50%	10.00%	100.00%
	% within sleep time	66.70%	34.10%	32.20%	66.70%	35.70%
5-7 hrs	Count	0	23	28	0	51
	% within screen time	0.00%	45.10%	54.90%	0.00%	100.00%
	% within sleep time	0.00%	52.30%	47.50%	0.00%	45.50%
> 7 hrs	Count	0	4	10	2	16
	% within screen time	0.00%	25.00%	62.50%	12.50%	100.00%
	% within sleep time	0.00%	9.10%	16.90%	33.30%	14.30%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 17.0; p <0.05 significant

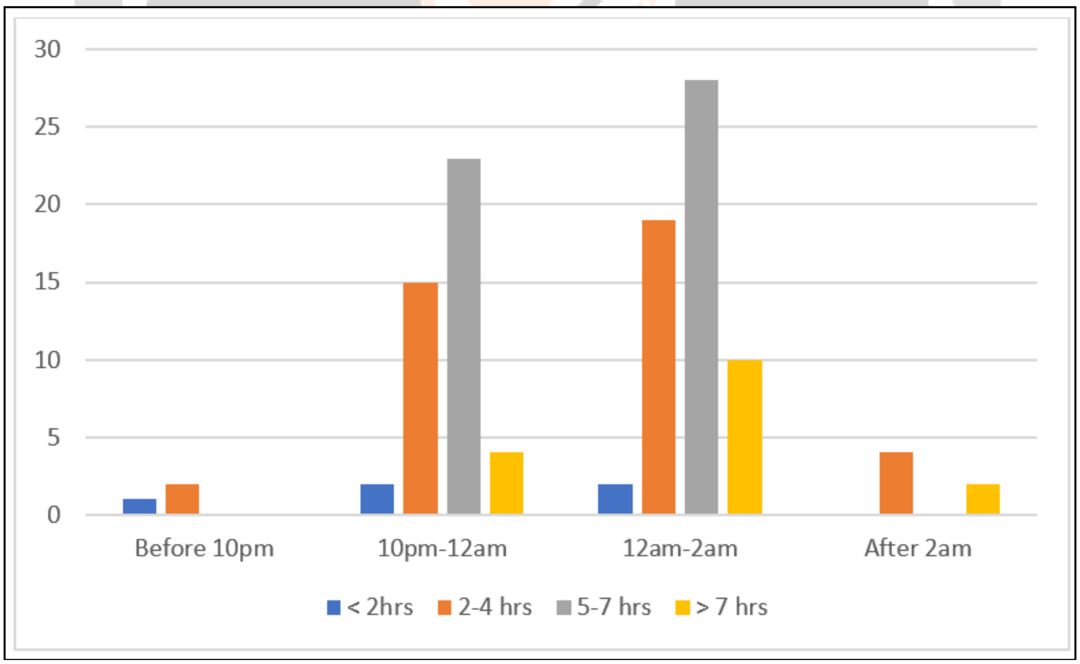

Chart 11 – Association between screen time and sleeping patterns.

The analysis of sleep duration categorized into different time brackets reveals distinct patterns in relation to screen time. Sleep durations of less than 2 hours were reported in five instances, with a notable occurrence between 10 pm and 2 am, suggesting late-night screen exposure potentially contributing to short sleep durations. Sleep durations of 2-4 hours, the most common category with 40 instances, displayed a peak between 10 pm and 12 am, indicating a significant proportion of individuals engaging with screens during this time period. Similarly, sleep durations of 5-7 hours and over 7 hours predominantly occurred between 10 pm and 2 am, highlighting consistent screen engagement during nighttime hours across varying sleep durations.

The chi-squared test confirms a significant association between sleep time and screen time, suggesting that the duration of sleep may be influenced by the time spent on screens, particularly during late-night hours. Overall, these findings suggest a relationship between sleep duration and screen exposure, emphasizing the importance of mindful screen usage habits for maintaining healthy sleep patterns.

Result table : 3.13 - Association between thoughts while going to bed and sleep time.

		Sleep time				
Thoughts while going to bed		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Calm most of the time	Count	2	13	13	1	29
	% within thoughts	6.90%	44.80%	44.80%	3.40%	100.00%
	% within sleep time	66.70%	29.50%	22.00%	16.70%	25.90%
Exhausted	Count	0	13	19	1	33
	% within thoughts	0.00%	39.40%	57.60%	3.00%	100.00%
	% within sleep time	0.00%	29.50%	32.20%	16.70%	29.50%
Anxious	Count	0	2	3	0	5
	% within thoughts	0.00%	40.00%	60.00%	0.00%	100.00%
	% within sleep time	0.00%	4.50%	5.10%	0.00%	4.50%
Overthinking	Count	1	16	24	4	45
	% within thoughts	2.20%	35.60%	53.30%	8.90%	100.00%
	% within sleep time	33.30%	36.40%	40.70%	66.70%	40.20%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 5.7; p >0.05 not significant

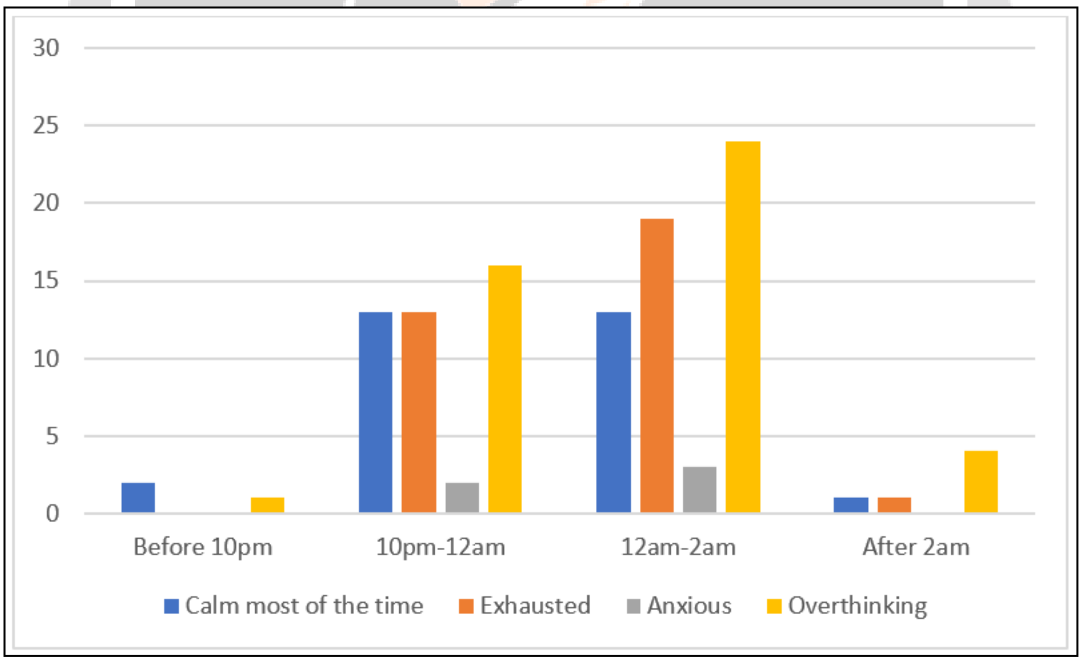

Chart 12 - Association between thoughts while going to bed and sleep time.

The analysis of pre-sleep thoughts, including feelings of calmness, exhaustion, anxiety, and overthinking, yields interesting insights into bedtime mental states. While 29 instances were reported of individuals feeling calm most of the time before bed, 33 instances noted feelings of exhaustion, 5 instances reported anxiety, and 45 instances experienced overthinking.

Despite these varying mental states, the chi-squared test indicates a lack of significant association between pre-sleep thoughts and sleep time, with a chi-squared value of 5.7 and a p-value exceeding 0.05. This suggests that the frequency of different mental states before bed may not strongly correlate with specific sleep times. However, individual experiences and external factors likely contribute to the diversity in bedtime mental states, emphasizing the complexity of the relationship between thoughts before sleep and sleep timing.

Result table : 3.14 – Association between weight change and sleeping habits.

		Sleep time				
Weight change		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
No change	Count	1	13	14	1	29
	% within weight change	3.40%	44.80%	48.30%	3.40%	100.00%
	% within sleep time	33.30%	29.50%	23.70%	16.70%	25.90%
Increased	Count	1	13	23	0	37
	% within weight change	2.70%	35.10%	62.20%	0.00%	100.00%
	% within sleep time	33.30%	29.50%	39.00%	0.00%	33.00%
Decreased	Count	1	6	7	1	15
	% within weight change	6.70%	40.00%	46.70%	6.70%	100.00%
	% within sleep time	33.30%	13.60%	11.90%	16.70%	13.40%
Fluctuating	Count	0	12	15	4	31
	% within weight change	0.00%	38.70%	48.40%	12.90%	100.00%
	% within sleep time	0.00%	27.30%	25.40%	66.70%	27.70%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 8.6; p >0.05 not significant

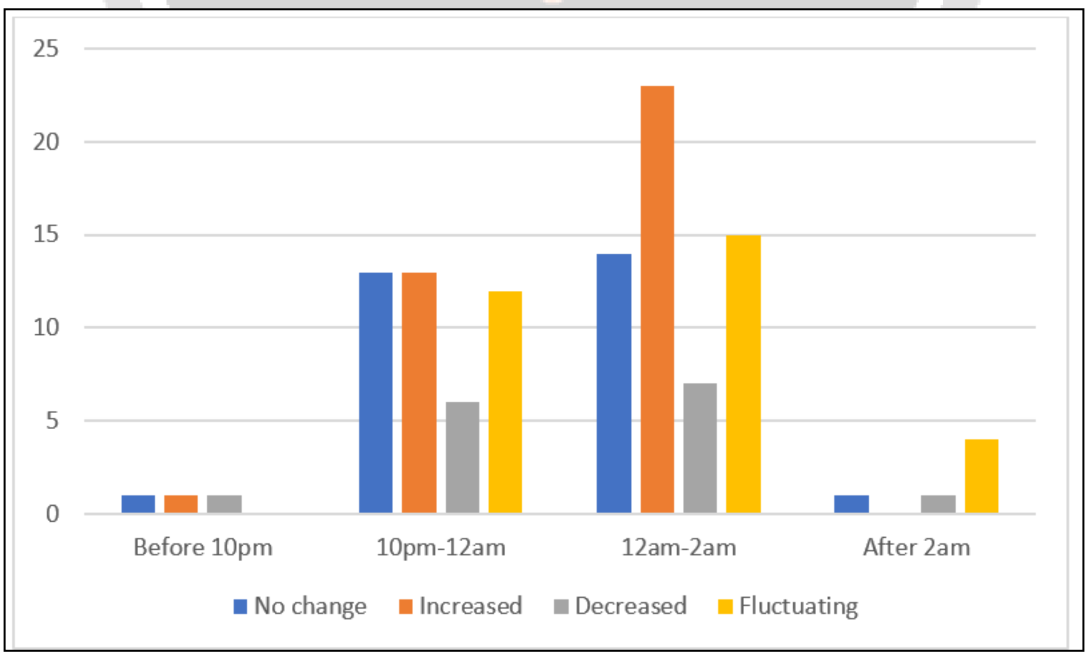

Chart 13 – Association between weight change and sleeping habits.

The provided data outlines reported instances of weight changes among individuals across different sleep times. These changes include instances of no weight change, weight gain, weight loss, and weight fluctuations.

However, upon conducting a chi-squared test, the resulting chi-squared value of 8.6 with a p-value greater than 0.05 indicates a lack of significant association between sleep time and weight change. In essence, this suggests that the variation in sleep timing does not exhibit a strong correlation with reported changes in weight among the surveyed individuals. While sleep is known to influence various aspects of health, these findings suggest that other factors beyond sleep timing may have a more substantial impact on weight changes, underscoring the complex interplay of lifestyle, diet, and physical activity in determining body weight fluctuations.

Result table : 3.15 – Association between physical activity and sleep time.

		Sleep time				
Physical activity		**Before 10pm**	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
Yes	Count	3	38	50	5	96
	% within activity	3.10%	39.60%	52.10%	5.20%	100.00%
	% within sleep time	100.00%	86.40%	84.70%	83.30%	85.70%
No	Count	0	6	9	1	16
	% within activity	0.00%	37.50%	56.30%	6.30%	100.00%
	% within sleep time	0.00%	13.60%	15.30%	16.70%	14.30%
Total	**Count**	**3**	**44**	**59**	**6**	**112**

Chi-sq value is 0.8; p >0.05 not significant

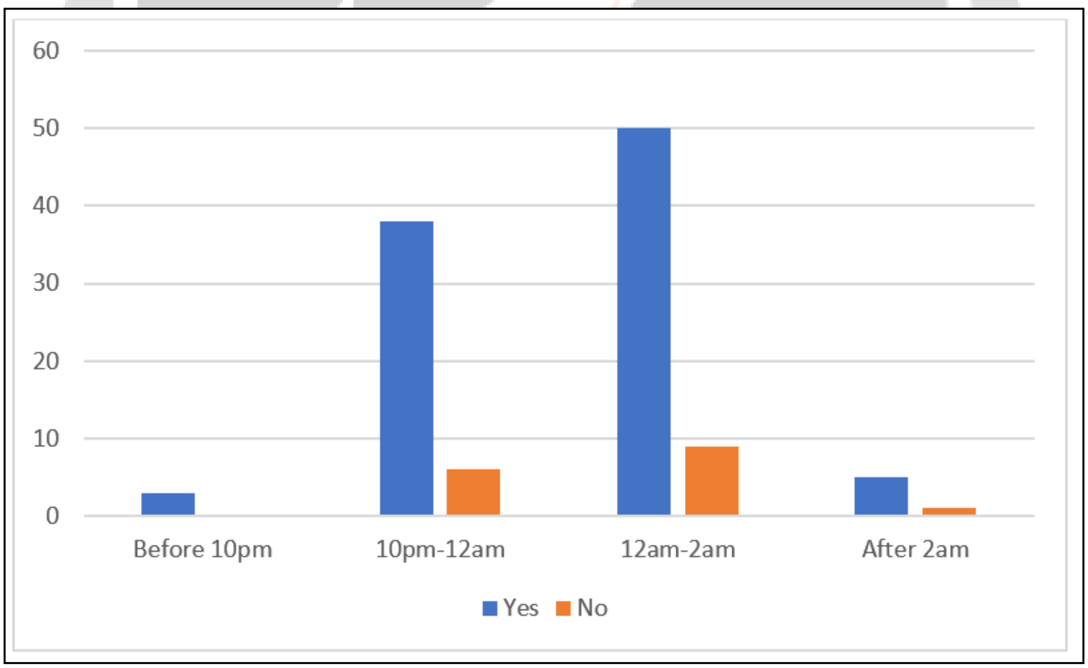

Chart 14 – Association between physical activity and sleep time.

The analysis of physical activity and its relationship with sleep time reveals interesting but non-significant findings. Out of the surveyed individuals, 96 instances were reported where individuals engaged in physical activity, while 16 instances noted no physical activity. However, the chi-squared test yielded a value of 0.8 with a p-value greater than

0.05, indicating a lack of significant association between physical activity and sleep time. This suggests that, based on this dataset, physical activity does not appear to significantly influence the timing of sleep among the individuals surveyed.

While physical activity is known to impact various aspects of health, including sleep quality, these findings imply that other factors beyond mere engagement in physical activity may play a more prominent role in determining sleep patterns among the surveyed population. These could include factors such as stress levels, lifestyle habits, and individual sleep preferences.

Result table : 3.15

		Mean value	Std. Deviation	P value	
AGE	Before 10pm	23.33	0.577	0.825	not significant
	10pm-12am	22.52	5.205		
	12am-2am	23.27	5.401		
	After 2am	21.67	2.422		

The standard deviation (variability) of age is highest for the 12am-2am sleep time period (5.401).

The p-value for age across different sleep times is not significant (greater than 0.05).

Result table 3.16

BMI	Before 10pm	23.6703	9.33922	0.973	not significant
	10pm-12am	23.3586	4.65017		
	12am-2am	23.5385	4.62804		
	After 2am	22.6277	2.10004		

The standard deviation of BMI varies across sleep time periods. The p-value for BMI across different sleep times is not significant (greater than 0.05).In summary, there doesn’t appear to be a strong association between age/BMI and sleep time.

Result table 3.17 Comparing BMI with sleep timings.

		Sleep time				
		Before 10pm	**10pm-12am**	**12am-2am**	**After 2am**	**Total**
1	Count	1	6	5	0	12
	% within BMI_cats	8.30%	50.00%	41.70%	0.00%	100.00%
	% within WHENDOYOUUSUALLYGOTOBED	33.30%	13.60%	8.50%	0.00%	10.70%
2	Count	1	23	33	5	62
	% within BMI_cats	1.60%	37.10%	53.20%	8.10%	100.00%
	% within WHENDOYOUUSUALLYGOTOBED	33.30%	52.30%	55.90%	83.30%	55.40%
3	Count	0	12	16	1	29
	% within BMI_cats	0.00%	41.40%	55.20%	3.40%	100.00%
	% within WHENDOYOUUSUALLYGOTOBED	0.00%	27.30%	27.10%	16.70%	25.90%

4	Count	1	3	5	0	9
	% within BMI_cats	11.10%	33.30%	55.60%	0.00%	100.00%
	% within WHENDOYOUUSUALLYGOTOBED	33.30%	6.80%	8.50%	0.00%	8.00%
	Count	3	44	59	6	112
	% within BMI_cats	2.70%	39.30%	52.70%	5.40%	100.00%
	% within WHENDOYOUUSUALLYGOTOBED	100.00%	100.00%	100.00%	100.00%	100.00%

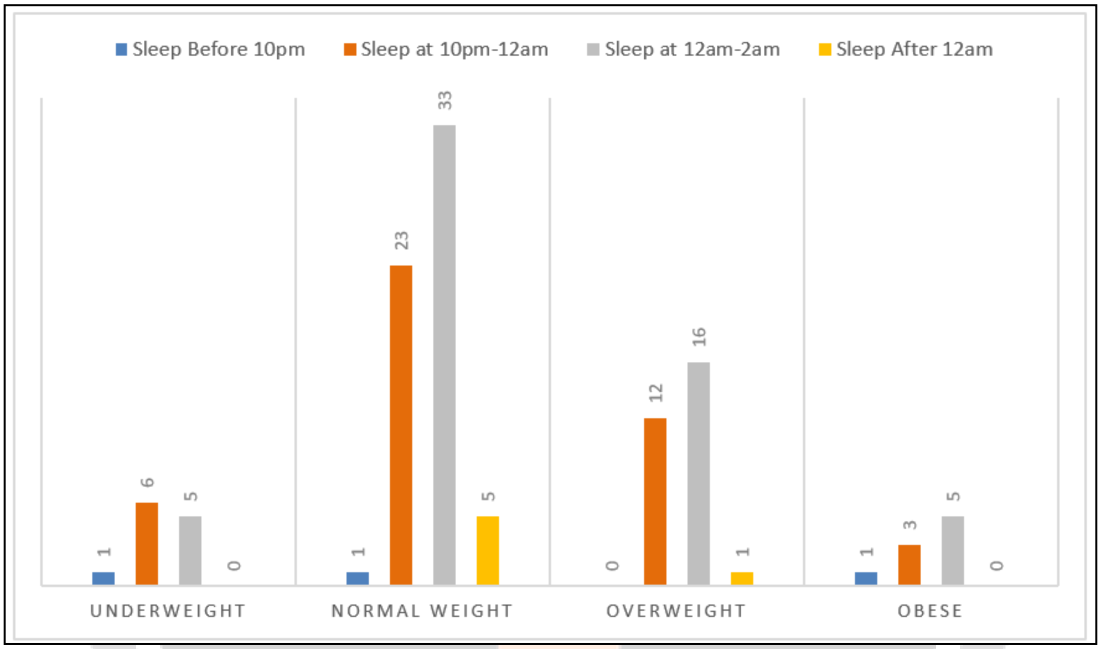

Chart 15 - Comparing BMI with sleep timings.

It appears that the majority of participants (112 in total) fall into four different categories based on their bedtime preferences and body mass index (BMI):

1. **Early Sleepers (Before 10pm):** This group consists of 12 participants (8.3% of the total). They tend to go to bed before 10 pm. Interestingly, most of them (33.3%) are in the underrepresented category of "After 12am" bedtime preference.
2. **Midnight Sleepers (10pm-12am):** The largest group comprises 62 participants (55.4% of the total). They typically go to bed between 10 pm and midnight. Among them, 52.3% prefer bedtime between 10 pm and midnight, while 55.9% fall into the "12am-2am" category.
3. **Late Sleepers (12am-2 am):** This group includes 29 participants (25.9% of the total). They tend to go to bed after midnight. Interestingly, 27.3% of them also fall into the "Before 10pm" category, suggesting some variability in their sleep patterns.
4. **Very Late Sleepers (After 2am):** The smallest group consists of 9 participants (8% of the total). They have a strong preference for going to bed after midnight (55.6% in the "12am-2am" category). Notably, none of them fall into the "After 2am" category, indicating a consistent late-night preference.

4. CONCLUSIONS

In conclusion, this thesis titled "Exploring Dietary Preferences in Youth Including Anthropometric Indicators Associated with Sleep Inadequacy" provides valuable insights into the multifaceted relationship between dietary habits, sleep patterns, and anthropometric indicators among young individuals. Through meticulous analysis, several key findings have been uncovered, enriching our understanding of the complex interplay between these factors. The study emphasizes the importance of behavioral factors such as late-night activities and meal timing in influencing sleep quality among youth. It underscores the need for targeted interventions aimed at promoting healthier nighttime routines and meal schedules to address sleep inadequacy effectively.

Furthermore, the research highlights the significant impact of factors like caffeinated beverages and excessive screen time on sleep quality, emphasizing the importance of comprehensive sleep hygiene practices. Strategies such as limiting caffeine intake and reducing screen exposure before bedtime may play a crucial role in improving sleep outcomes among young individuals. While psychological factors such as overthinking before bed were not found to be significantly associated with sleep time in this study, their acknowledgment remains crucial. Further investigation into the relationship between mental health and sleep outcomes is recommended to develop tailored interventions focusing on psychological well-being in youth populations.

Additionally, although no significant association was observed between sleep time and weight change or BMI, the examination of anthropometric indicators provides valuable insights into the intricate relationship between sleep and metabolism among youth. Longitudinal studies are suggested to explore the long-term effects of sleep inadequacy on anthropometric measures in this demographic thoroughly.

Overall, this research contributes to a comprehensive understanding of the intricate relationship between dietary preferences, sleep patterns, and anthropometric indicators in youth populations. By elucidating these complex interactions, the study lays the groundwork for targeted interventions aimed at promoting healthier lifestyles and improving sleep outcomes among young individuals, thereby enhancing their overall health and well-being.

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