Research Article

A Study on The Relationship of Body Mass Index with Screen Time and Time of Sleep in First Year Students in a Medical College in Kolkata

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ABSTRACT

Introduction and Aim: Obesity is a rising public health issue in India, with the young generation particularly at risk. Lifestyle changes, increased screen time and altered sleep patterns are risk factors for obesity in students with high workload, and studies requiring significant digital accessibility. This study aims to explore the relationship between Body Mass Index (BMI), screen time, and post-9 pm awake time among first-year MBBS students in a Kolkata-based medical college, with attention to gender-specific variations.

Materials and Methods: An observational cross-sectional study was conducted among 112 consenting first-year MBBS students at KPC Medical College, Kolkata. Data on BMI, 24-hour screen time, and post-9 pm awake time were collected via structured questionnaires. Statistical analysis included central tendency and dispersion measurement, Student's unpaired t-test, and Pearson correlation using SPSS v27.

Results: The mean BMI of participants was 23.17 kg/m², mean 24-hour screen time was 5.26 hours, and mean post-9 pm awake time 4.08 hours. No significant correlation was found between BMI and screen time (R = 0.0508, $p = 0.59$). A moderate positive correlation was observed between BMI and post-9 pm awake time (R = 0.5938, $p < 0.00001$), more pronounced in males (R = 0.7075) than in females (R = 0.4807). Gender-wise differences in screen time were significant ($p = 0.009$).

Conclusion: Screen time showed no significant association with BMI. Late-night wakefulness demonstrated moderate correlation with increased BMI. Addressing sleep hygiene may be critical in health promotion strategies among medical students.

Keywords: Body Mass Index; Screen time; Sleep pattern; Medical students

1. INTRODUCTION

1.1 REVIEW OF LITERATURE

Over 135 million individuals in India are affected by obesity and the prevalence rate varies significantly across states and regions. A study conducted by ICMR-INDIAB in 2015 reported obesity rates ranging between 11.8% to 31.3%, and central obesity rates between 16.9% and 36.3% [1]. Urban populations exhibited higher obesity rates compared to rural areas. Obesity prevalence was generally higher among women than men. Higher socioeconomic status & urbanization were associated with increased obesity prevalence [1]. Under a high urbanization scenario in India, the prevalence of overweight is expected to increase to 28.4% among women & 27.0% among men by 2040 [1]. Kalra and Unnikrishnan (2012) studied the rising prevalence of obesity in India and its associated risk factors. They attributed the growing burden of obesity of the country to rapid urbanization, changes in dietary patterns, and decreased physical activity. This leads to an increased burden of metabolic syndrome and type 2 Diabetes mellitus [1]. Banks et al discussed the obesogenic environment, characterized by increased availability of high-calorie foods and sedentary entertainment options, as a significant factor in the rising obesity rates among adolescents [1].

Eighty-five percent of the Indian adolescents spend more than 2 hours per day on screen-based activities. Additionally, 36.9% had poor sleep quality, as indicated by Pittsburgh Sleep Quality Index (PSQI) scores above 5. Girls reported higher screen time (218.2 minutes/day) compared to boys (165.3 minutes/day), and also had poorer sleep quality. The co-occurrence of low physical activity, excessive screen time, and poor sleep quality was observed in 18.8% of the adolescents [1]. A cross-sectional nationwide online study in 2024 concluded that increased screen time is significantly associated with insomnia among Indian adults, especially the younger population [1]. Recent studies also concluded that increased screen time is associated with higher odds of elevated blood pressure among young adults in North India, independent of BMI [1]. A study conducted in the Hoogly district of West Bengal exhibited that unhealthy dietary habits and insufficient physical activity contributed to increased cardio-metabolic risks, in both urban and rural populations [1]. Barua *et al.,* in a study conducted in 2011 on the obese population of Kolkata, identified that obesity was associated with poor dietary habits (high intake of fats and sugars), lack of physical activity and sedentary behaviors (e.g., excessive screen time) among others [1].

The 2023 study by Ghosh et al on academic professionals in West Bengal confirmed the role of sedentary lifestyle and low physical activity as a risk factor for obesity and associated health hazards like Type 2 Diabetes, Cardiovascular diseases, hypothyroidism and arthritis [1].

Studies emphasized the importance of adequate sleep in preventing obesity. Environmental factors, such as the presence of electronic devices in bedrooms contribute to reduced sleep duration and should be addressed to promote better sleep hygiene. Excess screen time is associated with sleep problems in young adults, females being affected more than males [2]. Screen time in the post-pandemic era has significantly increased. Increased screen time was associated with a change in dietary pattern, e.g. skipping breakfast, consumption of fast food and fried food and carbonated beverages. All these can adversely affect weight [2]. A study conducted on the first year medical students in a medical college in Bhubaneshwar revealed that usage of electronic devices for a longer duration posed to be a significant risk factor for obesity, as it promotes a sedentary lifestyle and increased consumption of food despite not being hungry [2]. A similar study on medical students in a medical college in Karnataka revealed significant impact of excess smart phone use on sleep and physical health. This effect was more pronounced in males than females [2].

While excessive smart phone usage is in itself, a risk factor for obesity and other health problems, its excess use particularly during bedtime, is particularly detrimental. Study revealed that excess smart phone use during bedtime caused decreased engagement in assigned activities on the next morning and was probably related to lack of sleep [2]. Another study, conducted on the young adolescents of Spain, revealed that presently, mobile phones are a part of every child's daily life. There is a significant screentime, especially at bedtime, with girls showing greater screentime than boys. Also, there was a high proportion of overweight and obesity among these subjects [2].

A study conducted on medical students at a tertiary care hospital in West Bengal concluded that screen time in excess of 4-6 hours per day had a positive correlation with insomnia [2]. Another study at the same institution revealed a significant percentage of obesity in students who used some form of screentime in excess, e.g. mobile, computer or TV. This was also associated with reduced physical activity [2].

So, most studies revealed a positive correlation between excess screentime and obesity. However, whether or not excess screentime during bedtime affects physical health, and that too in young adolescents, has not been researched much. The data is all the more inadequate in West Bengal, particularly Kolkata. This article aims to study the impact of screen-time and adiposity among medical students, with an aim to explore possible correlations and their role in health promotion.

1.2 AIMS AND OBJECTIVES:

General Objective:

- To study the relationship of body mass index with screen time and time of sleep in first year students in a medical college in Kolkata

Specific Objective:

- To explore the relationship between 24-hour screen time and body mass index among medical students in Kolkata
- To study any existing association between time of sleep and obesity or overweight in medical students in Kolkata
- To identify the gender-specific prevalence of increased screen time, late night sleeping habit and overweight or obesity in medical students in Kolkata

2. MATERIALS & METHODS:

2.1 Nature of study: Observational cross-sectional study

2.2 Place of study: Department of Physiology, KPC Medical College & Hospital, Jadavpur, Kolkata.

2.3 Study population: Students studying in the Phase-I of MBBS, at KPC Medical College & Hospital, Jadavpur, Kolkata, in the academic session 2022-23.

2.4 Study variables: Association of two variables – 24-hour screen time, and post-9 pm awake time, are studied with the body mass index of the participants.

24-hour screen time was defined as the total time in hours spent on screen-based electronic devices like mobile phones, tablets, laptops, desk-tops and television.

Post-9 pm awake time was defined as the time duration in hours, that a person keeps awake for, beyond 9 pm, before falling asleep. [As the exact time of sleep expressed in 00:00 format will be a circular variable, the introduction of post-9 pm awake time as a modified parameter makes the variable a continuous linear variable.]

2.5 Inclusion criteria:

All consenting first year MBBS students of the session 2022-23 of KPC Medical College and Hospital, Kolkata.

2.6 Exclusion criteria:

1. Non-consenting students
2. Students pre-diagnosed with metabolic diseases or endocrinopathies

2.7 Sample size:

Sample size was calculated using the equation for finite population.

$$\text{Unlimited population: } n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

$$\text{Finite population: } n' = \frac{n}{1+\frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2 N}}$$

Where,

- z is the z score = 1.96 at a confidence interval of 95%
- ε is the margin of error = 5%
- N is the population size = 150
- p̂ is the population proportion = 37.5%

the calculated minimum sample size was 107. We conducted the study on 112 consenting subjects.

a) Sampling Method:

All 150 students studying First Professional MBBS, in the session 2022-2023 at KPC Medical College and Hospital, Kolkata, were explained in detail about the nature of the study and handed over the questionnaire with the consent form. Sampling was based on volition (voluntary sampling). All 112 participants who expressed willingness to participate were included after obtaining written consent from each of them.

b) Statistical Methods:

The collected data were tabulated in Microsoft Excel spreadsheet and analysed using IBM-SPSS V.27. The central tendency (mean, median and mode) and dispersion (standard deviation and range) of each parameter were calculated. The data were tested for homogeneity of variance using Levene's test. The array of data on body mass index and screentime from male and female students were then subjected to Student's T test (unpaired) for comparison of means. The dataset was tested for normal distribution using Kolmogorov-Smirnov test, and was found to be normally distributed. Further, correlation between screentime and body mass index in different subgroups was tested using Pearson's correlation coefficient. P values were calculated using the R score and sample size. A significance

level of $p < 0.05$ were considered to be statistically significant.

3. RESULTS AND DISCUSSION:

3.1 RESULTS:

Table 1. Central tendency and dispersion of Body Mass Index (BMI), Post-9 pm wake time (in hours) and 24-hour screen time (in hours) [n = 112]

Parameter	BMI (kg/m^2)	Post-9 pm wake time (hour)	24-hour Screentime (hour)
Mean	23.17	4.08	5.2589286
Median	23.53	4	5
Mode	21.6	4	6
SD	3.58	1.59	1.83

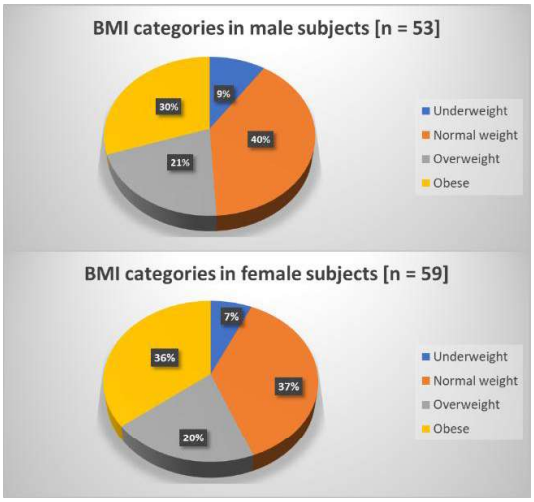

Figure 1. Distribution of BMI categories among male and female subjects [n = 112]

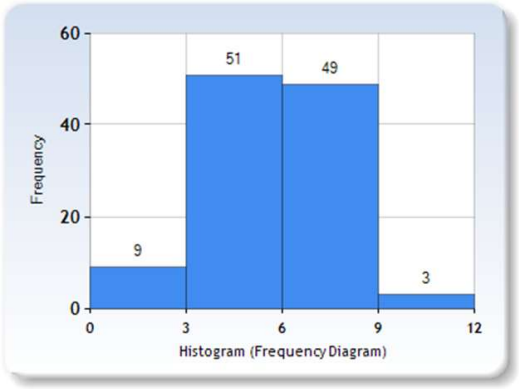

Figure 2. Histogram showing frequency of different durations of screen time in 24 hours among first year medical students [n = 112].

Table 2. Central tendency and dispersion of Body Mass Index (BMI), Post-9 pm wake time (in hours) and 24-hour screen time (in hours) in females [n = 59]

Parameter	BMI (kg/m^2)	Post-9 pm wake time (hour)	24-hour Screentime (hour)
Mean	23.40	4.15	5.64
Median	23.82	4	6
Mode	15.12	4	6
SD	3.62	1.5	1.6

Table 3. Central tendency and dispersion of Body Mass Index (BMI), Post-9 pm wake time (in hours) and 24-hour screen time (in hours) in males [n = 53]

Parameter	BMI (kg/m^2)	Post-9 pm wake time (hour)	24-hour Screentime (hour)
Mean	22.92	4	4.83
Median	23.27	4	5
Mode	14.14	4	4
SD	3.54	1.7	2

Figure 3. Comparison of BMI, Screen-time and Post-9 pm awake time in male and female subjects

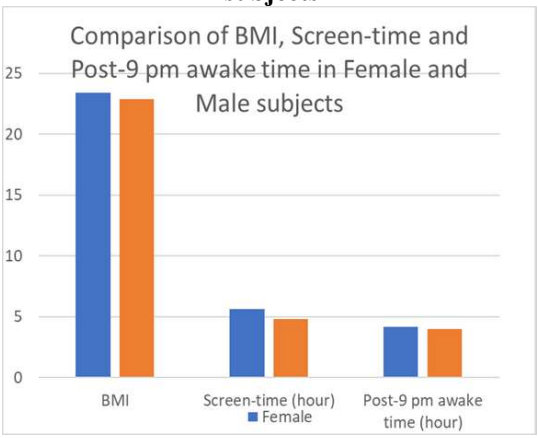

Table 4. Findings of Student's T test of comparison of means (unpaired) expressed as T and P values. The f-ratio calculated by Levene's T test of Homogeneity of Variance is calculated to determine the appropriateness of application of Student's T test to the array of data.

Variables compared between male and female subjects through unpaired Student's T test	Levene's Test of Homogeneity of Variance	T value	P value
BMI	• The *f*-ratio value is 0.02304. The *p*-value is .879641. • The result is *not* significant at $p < .05$. • The requirement of homogeneity is met.	0.71	0.24
SCREEN TIME	• The *f*-ratio value is 2.23143. The *p*-value is .138092. • The result is *not* significant at $p < .05$. • The requirement of homogeneity is met.	2.4	0.009*
POST 9-pm awake time	• The *f*-ratio value is 0.32077. The *p*-value is .572301. • The result is *not* significant at $p < .05$. • The requirement of homogeneity is met.	0.50	0.31

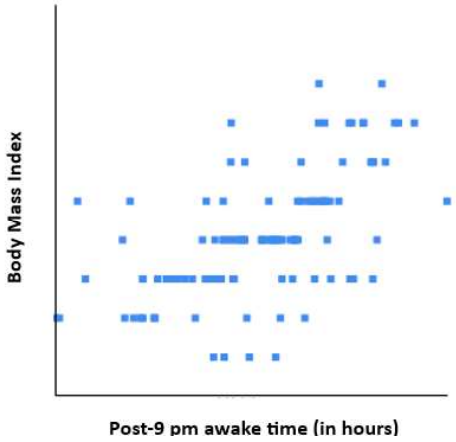

Figure 4. Pearson Correlation between BMI and Post-9 pm awake time among study subjects [n = 112]

The P-Value is < .00001. The result is significant at p < .05.

The value of R is 0.5938.

This is a moderate positive correlation, which means there is a tendency for high post-9 pm awake time scores go with high Body Mass Index scores (and vice versa).

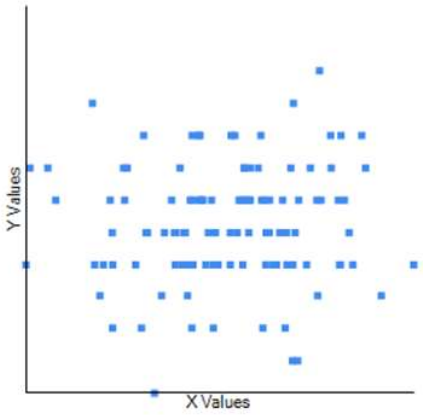

Figure 5. Pearson Correlation between BMI (Y-variable) and 24-hour Screentime (X-variable) in study subjects [n = 112]

The value of R is 0.0508.

Although technically a positive correlation, the relationship between your variables is weak (*nb.* the nearer the value is to zero, the weaker the relationship).

The P-Value is .594775. The result is *not* significant at p < .05.

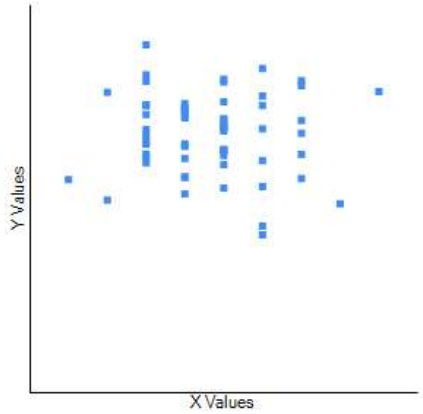

Figure 6. Pearson Correlation between BMI (Y-variable) and screen-time (X-variable) in female subjects [n = 59]

The value of R is -0.0397.

Although technically a negative correlation, the relationship between your variables is only weak (*nb.* the nearer the value is to zero, the weaker the relationship).

The P-Value is .821548. The result is *not* significant at p < .05.

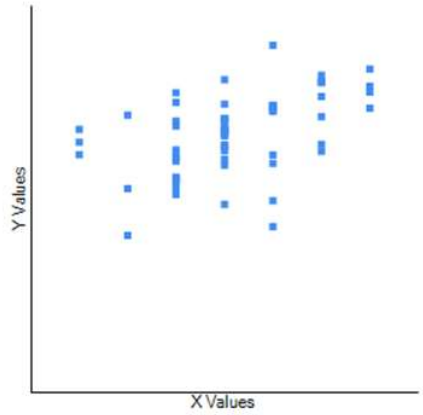

Figure 7. Correlation between BMI (Y-variable) and post-9 pm awake time (X-variable) in female subjects.

The value of R is 0.4807.

Although technically a positive correlation, the relationship between your variables is weak (*nb.* the nearer the value is to zero, the weaker the relationship).

The P-Value is .000116. The result is significant at p < .05.

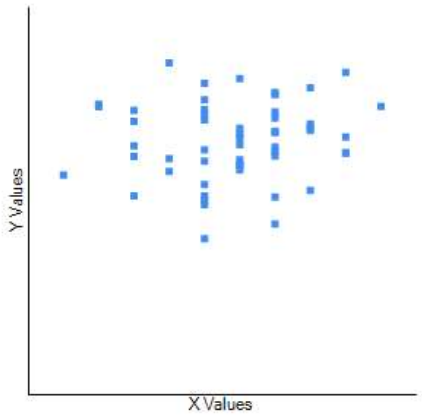

Figure 8. Correlation between BMI and screen-time in male subjects.

The value of R is 0.107.

Although technically a positive correlation, the relationship between your variables is weak (*nb.* the nearer the value is to zero, the weaker the relationship).

The P-Value is .445708. The result is *not* significant at $p < .05$.

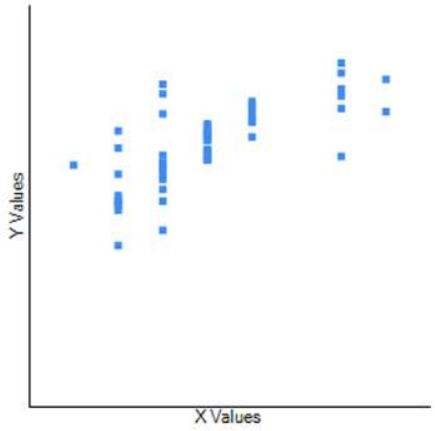

Figure 9. Correlation between BMI (Y-variable) and post-9 pm awake time (X-variable) in male subjects.

The value of R is 0.7075.

This is a moderate positive correlation, which means there is a tendency for high X variable scores go with high Y variable scores (and vice versa).

The P-Value is < .00001. The result is significant at $p < .05$.

3. DISCUSSIONS:

A study by Ghosh *et al.,* conducted in 2023 in West Bengal, confirmed the association of sedentary lifestyle and physical inactivity as a risk factor for increased adiposity among professionals engaged in academia [11]. A study conducted in Bhubaneshwar on the MBBS Phase-I students associated long-duration usage of electronic devices to the high prevalence of obesity, predicting the role of sedentary lifestyle and over-consumption of food unrelated to hunger [15].

This study was conducted among the first year medical students studying in a private medical college in Kolkata. Moitra P., Madan J. & Verma P. reported in 2021, that 85% of the Indian adolescents engage in screen-based activities for more than 2 hours in a day. In our study, 92% of the medical students were found to spend more than 2 hours a day for screen-based activities. The percentage of students spending 3-6 hours in a day was 46%, and those spending 6-9 hours in a day comprised 44% of all students. Students spending more than 9 hours a day on screen-based activities comprise 2.7% of all students. The mean 24-hour screen-time was 5.3 hours, with a standard deviation of 1.83 hours, and a range of 0-10 hours.

In our study, BMI had no significant correlation with screen-time in either male (R = 0.1) or female (R = -0.03) students, as well as all students taken together (R = 0.05). However, BMI had positive correlation with post-9 pm awake time in both the sexes. The correlation was stronger in males (R = 0.71) than in females (R = 0.48). Thus, it appears that, post-9 pm awake time causes a steeper rise in the BMI in males, compared to that in females.

We wish to expand this cross-sectional study into a longitudinal study in future with increased sample size, with modification of the screen-time habits, and additional wet lab tests like serum lipid profile, glycemic status, etc. which may through more insight into the effect of screen-time on the metabolic parameters of the study subjects.

4. CONCLUSION:

This study found no significant correlation between BMI and screen time among first-year medical students, but a moderate positive correlation was observed between BMI and post-9 pm awake time, particularly in males. These

findings suggest that late-night wakefulness may play a more critical role in increased BMI than overall screen usage. Promoting healthier sleep habits could be more effective than solely reducing screen time in addressing weight management among students. Interventions aimed at improving sleep hygiene should be considered essential in student wellness programs to prevent obesity and associated health risks.

Conflict of Interest

We affirm that this publication is free from any known conflicts of interest, and no substantial financial backing was received that might have impacted the results presented.

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Ethical Information

The research was carried out with full respect for participant anonymity and confidentiality, following approval from the Institutional Ethics Committee of KPC Medical College & Hospital, Jadavpur.

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