Original Article

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Breakfast Eating Habits and their Association with Academic Performance: A Cross-sectional Study among Medical Students

Physiology Section

NAVNEET KUMAR KAUSHIK[1], SWATI MISHRA[2], ANJU SHARMA[3], MOHITA SINGH[4], SHAILESH MISHRA[5]

ABSTRACT

Introduction: Breakfast has long been considered the most important meal of the day, yet the frequency of breakfast consumption has declined in recent decades. Adequate breakfast habits are related to optimal physiological, psychological, and social health.

Aim: To assess the breakfast eating habits of medical students and find the association between breakfast habits and academic performance.

Materials and Methods: A cross-sectional, observational study was carried out in the Department of Physiology at Shaheed Hasan Khan Mewati (SHKM) Government Medical College, Nuh, Haryana, India. The duration of the study was three months from July 2022 to September 2022. A total of 350 apparently healthy medical undergraduates from the second year to final year participated in the study. Breakfast eating patterns and other characteristics of the morning meal consumed by participants were assessed using a structured proforma. Participants were divided into three groups (regular, irregular, and skippers) based on the frequency of breakfast consumption. Academic performance was assessed based on the aggregate marks (%) obtained in the university examination. Data were compiled and analysed using Statistical Package for Social Sciences (SPSS) software version 20.0 (SPSS Inc., Chicago, IL, USA). One-way Analysis of Variance (ANOVA) was used to compare academic performance (% marks) among the breakfast groups, and the relationship between the aforementioned variables was determined using Pearson's Chi-square test. A p-value of <0.05 was considered statistically significant.

Results: The mean age of the study participants was 20.95±1.10 years. Present study showed that only around one-third, 121 (34.6%) students ate breakfast regularly (6-7 days/week), while the remaining either consumed it irregularly or skipped it altogether. A significant association (p=0.02) was found between breakfast habits and academic performance, with regular breakfast eaters performing better compared to skippers.

Conclusion: Irregular consumption of breakfast is quite prevalent among medical students. Poor time management emerged as the main reason for this behaviour. Breakfast habits may influence academic performance, but it warrants further investigation using a multivariate approach.

Keywords: Breakfast eating patterns, Irregular consumption of breakfast, Psychological health, Social health

INTRODUCTION

Breakfast is the first and one of the most important meals of the day [1]. Children and adolescents skip breakfast more often than any other meal. The omission of breakfast is highly prevalent in the United States (US) and Europe (10% to 30%), depending on the age group, population, and definition. Breakfast consumption among adult Americans declined from 89% to 82% over a period of 30 years, between 1971 and 2002 [2,3]. At the university level, one out of three students skips breakfast. This omission entails diet consumption failures that are not compensated for in the rest of the meals and can have an effect on the student's performance [4,5]. Adequate breakfast habits are related to optimal physiological, psychological, and social health [6].

A breakfast with adequate nutritional quality may improve cognitive performance and regulate the quantity of food consumption in the following meals. A quality breakfast should provide 25% of the total energy intake of the day, nutrients according to daily needs, and has to be accessible and affordable [1,6]. This may help prevent chronic diseases like overweight, obesity, and diabetes and others such as eating disorders, particularly binges [7,8]. It has been repeatedly suggested that breakfast has a direct effect on psychological functions, particularly in tasks that require memory, concentration, learning, and decision-making based on the available information [9].

Higher education plays a crucial role in the advancement of society. Improving the academic performance of university students is a fundamental objective for any university. By improving their academic performance, university students could increase their probability of being accepted into a postgraduate study programme, as well as develop greater self-satisfaction. This has led universities to find various support measures to improve the academic performance of students [10].

Most of the research aimed at determining breakfast eating habits and their influence on academic performance had been carried out in Europe and the USA and was performed on elementary and high school students rather than university students. Therefore, the present study was primarily planned to assess the breakfast eating habits of undergraduate medical students at a medical college in Southern Haryana, India. In addition, the relationship between breakfast consumption and academic performance was also explored. It was hypothesised that breakfast consumers would have better academic performance than skippers.

MATERIALS AND METHODS

A cross-sectional, observational study was carried out at Shaheed Hasan Khan Mewati (SHKM) Government Medical College, Nuh, Haryana, India. The duration of the study was three months, from July 2022 to September 2022. The study protocol was approved by the Institutional Ethics Committee (SHKMGMC/IEC/2022/06/22), and informed written consent was obtained from the participants.

Inclusion criteria: Medical students of either gender within the age range of 19-24 years who showed willingness to participate were considered included in the study.

Exclusion criteria: Students suffering from any acute or chronic illness, Central Nervous System (CNS) pathology, or other morbidities were excluded from the study.

Sample size calculation: The power estimate for one-way ANOVA, using a confidence level of 95%, a sample size of 350, three groups, and Cohen's effect size of 0.2, was calculated to be approximately 78% using the non central F distribution function. This value is quite close to the desirable conventional norm of 80% [11].

Study Procedure

A total of 362 Bachelor of Medicine, Bachelor of Surgery (MBBS) students from the second through final year were enrolled in the study. However, 12 students were excluded due to incomplete details or not fitting within the inclusion criteria, resulting in a final sample size of 350 students. The participants were informed about the aim and assessments of the study. Information relevant to the study was obtained from the participants via Google Forms using a self-structured proforma. The proforma comprised two sections.

Section I included items related to the demographic and anthropometric characteristics of the participants, such as gender, age, height, weight, Body Mass Index (BMI), and aggregate marks (%) obtained in the university examination. The BMI was calculated by dividing weight in kilograms by height in squared meters (Weight/Height^2) and then categorised according to the World Health Organisation (WHO) criteria: underweight (≤18.49), normal weight (18.5-24.99 kg/m^2), overweight (25-29.99 kg/m^2), and obese (≥30 kg/m^2) [12].

Section II encompassed items inquiring about the frequency of breakfast consumption, consumption of fruits/vegetables/dairy products/eggs during breakfast, reasons for skipping the morning meal, usual time between waking up and eating breakfast, and subjective feelings experienced upon skipping breakfast. Based on their breakfast eating habits, participants were categorised into three groups: regular eaters (eating breakfast 6-7 days a week), irregular eaters (4-5 days/week), and skippers (habitually missed breakfast most days of the week). The sample was stratified based on their academic performance as follows: fair (50%-59.9%), good (60%-65%), and excellent (>65%).

STATISTICAL ANALYSIS

Data analysis was performed using SPSS version 20.0 software (SPSS Inc., Chicago, IL, USA). The results were presented as frequencies (n) and percentages (%) for categorical variables, and measures of central tendency and measures of dispersion were obtained for continuous variables. One-way ANOVA was used to compare academic performance across the breakfast habit groups. Pearson's Chi-square test was used to determine the association between breakfast eating habits and academic performance. Multiple linear regression analysis was also conducted to estimate the contribution of different independent variables, such as breakfast eating habit and gender, in explaining the variation in the dependent variable (aggregate marks). The level of significance considered was p<0.05.

RESULTS

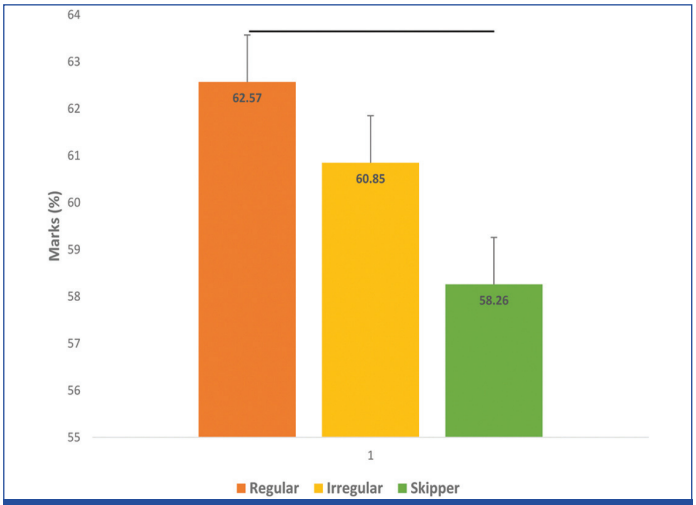
The study participants were aged between 19 and 24 years. The study sample had an over representation of males 273 (78%). The mean BMI (kg/m^2) of the participants was 22.20±2.89. More than two-thirds 241 (69%) of them were within the normal weight category, 67 (19%) were overweight, and the rest were underweight. The majority of them (95%) were residing in hostels [Table/Fig-1]. It was found that 121 (34.6%) participants habitually consumed breakfast (regular eaters), 207 (59.1%) consumed it irregularly (irregular eaters), and 22 (6.3%) did not consume it on most days of the week (skippers). The main reason 191 (54.4%) reported for skipping breakfast was a combination of lack of time and not liking the quality of the food served during morning meals. The average time between waking up and eating breakfast for 210 (60%) participants was less than or equal to one hour. There was an almost equal distribution of participants between those who experienced subjective effects such as drowsiness and lack of concentration during the morning session upon skipping breakfast and those who did not 168 (48%) experienced such symptoms.

Variables	Values
Gender n (%)	
Males	273 (78)
Females	77 (22)
Age (years) (Mean±SD)	20.95±1.10
Height (metres) (Mean±SD)	1.71±0.09
Weight (kg) (Mean±SD)	64.93±11.39
BMI (kg/m^2) (Mean±SD)	22.20±2.89
Accommodation n (%)	
Hostel	331 (94.57)
Rental	6 (1.72)
Parental home	13 (3.71)

[Table/Fig-1]: General characteristics of the participants (N=350).
SD: Standard deviation

A total of 235 (67%) participants reported an increase in appetite and greater consumption of food during subsequent meals of the day when breakfast was skipped. Among them, 86 (71%) were regular breakfast eaters, compared to only 6 (29%) skippers. It was found that 198 (60.4%) participants in the regular and irregular breakfast group reported consuming snacks during morning meals occasionally 180 (51.4%) or most days of the week 31 (8.8%). Only around 18 (5%) participants reported habitual consumption of fruits and vegetables during breakfast. Additionally, 108 (31%) participants consumed animal protein sources 2-3 times a week, while only 18 (5%) reported regular consumption.

One-way ANOVA revealed significant differences (p=0.009) in academic performance across the breakfast habit groups [Table/Fig-2]. There was a significant difference in aggregate marks (%) between participants in the regular breakfast group compared to the skipper group {4.31, 95% Confidence Interval (CI): 0.61-8.01}. This difference was found to have a large effect size (Cohen's d=1.14).



[Table/Fig-2]: Comparison of academic performance in relation to breakfast eating habits.
*Data shown as Mean (standard deviation error bar)
†Statistically significant (regular vs skipper), Test applied: ANOVA

A significant and relatively strong association (p=0.018, Cramer's V=0.47) was found between academic achievement and breakfast eating habits. A total of 16 (73%) cases who habitually skipped breakfast performed fairly, compared to only 25 (21%) students who ate breakfast regularly. There was a substantial difference in the percentage of participants who performed good to excellent

between regular eaters and skippers (79% vs 27%, respectively) [Table/Fig-3]. No significant association was found between the time of waking upto eating breakfast and the consumption of fruits, vegetables, and animal protein sources during morning meals. The relationship between consuming snacks during breakfast and the time of waking upto eating breakfast was also found to be insignificant. Multiple linear regression analysis revealed a significant relationship (p=0.02) between breakfast habit (regular eaters) and academic achievement, explaining about 7% of the variation. Gender was also found to be significantly associated (p=0.02) with academic performance, accounting for about 5% of the variation [Table/Fig-4].

Breakfast eating habit	Regular (n=121) n (%)	Irregular (n=207) n (%)	Skipper (n=22) n (%)	p-value	Cramer's V
Academic performance					
Fair (n=124)	25 (21)	83 (40)	16 (73)	**0.018***	**0.47**
Good (n=162)	57 (47)	99 (48)	6 (27)		
Excellent (n=64)	39 (32)	25 (12)	0		

[Table/Fig-3]: Association between breakfast eating habits and academic performance.
*Data expressed in frequencies of participants (%). p-value obtained with Pearson's χ^2 test

Dependent variable: aggregate marks (%)				
Independent variables	Co-efficients	Standard error	p-value	R^2
Breakfast habit				
Skipper	1 (ref value)			0.07
Regular	4.31	1.83	**0.02***	
Irregular	2.32	1.77	0.19	
Gender				
Male	1 (ref value)			0.05
Female	2.41	1.03	**0.02***	

[Table/Fig-4]: Multiple linear regression analysis to examine the influence of breakfast habits and gender on academic performance.
*Statistically significant (p<0.05)

DISCUSSION

Breakfast has long been considered the most important meal of the day, yet the frequency of breakfast consumption has declined in recent decades. The present study aimed to estimate the prevalence of breakfast skipping in a sample of Indian medical students. It observed that only around one-third of the students habitually ate breakfast, while the majority of the participants consumed breakfast irregularly or skipped it altogether. A systematic review found that young adults skip breakfast more frequently than other main meals, and the rates of skipping breakfast ranged from 14% to 88.5% [13]. Chitra U and Reddy CR, in their study among school children in Andhra Pradesh, India, reported that more than half of the school children skip breakfast on atleast some days of the week [14]. In another study carried out among school-going adolescents in Delhi, India, Arora M et al., reported a frequency of breakfast skipping at around 30% [15].

More than half 191 (54.4%) students cited lack of time and dislike for the food items served during morning meals as the main reasons for skipping breakfast. Among all meals, breakfast is probably the first to get compromised as a result of poor time management. Consistent with the aforementioned findings, a study among the Australian adolescent population also revealed that lack of time (43%) emerged as the main reason for skipping breakfast, followed by not being hungry in the morning (24%) and not enjoying breakfast (16%) [16]. Tambalis KD et al., reported that school children who skipped breakfast tended to have an unhealthy lifestyle profile [17].

In the current study, around 210 (60%) students consumed breakfast within one hour of waking up. Slightly more than half of the students reported subjective effects such as drowsiness and lack of concentration during the morning hours upon skipping breakfast. Frisvold DE, in his study, concluded that persistent exposure to a nutritious breakfast may enhance cognitive achievement [18].

In the present study, two-thirds of the participants reported an increase in hunger and consumption of bigger servings in subsequent meals of the day upon skipping breakfast. However, only about one-third of the students who habitually skipped breakfast reported the aforementioned behaviour. This finding may be attributed to the formation of a habit of remaining hungry to the extent that it becomes imperceptible over time. Szayeuska H and Ruszczynki M documented in their study that breakfast omission increases hunger and the consumption of bigger servings in subsequent meals [19]. However, much of the research suggests that breakfast eaters tend to have a higher total daily intake of energy compared to breakfast skippers. On an average, children and adolescents who skip breakfast do not make up for the nutrient deficits at other meals during the day. It is worth noting that despite the body of literature reporting a higher daily energy and nutrient intake in habitual breakfast eaters compared to breakfast skippers, there is evidence suggesting that the former tend to have a favourable BMI compared to the latter, although the relationship between breakfast consumption habits and body weight is less well-established [20,21].

Snack consumption, either occasionally or regularly during morning meals, was quite prevalent (around 60%) among the study participants. Shrivastav M and Thomas S reported a similar high proportion (62%) of snacking between meals in their study sample [22]. In developed countries as well, a high percentage of children and college students have reported skipping meals and increased snacking behaviour [23]. Irregular snacking behaviour poses extreme risks to the health of children and adolescents, including cardiovascular, neurological, and metabolic complications. There is a need to increase awareness among the younger generation regarding the health impact of snacking, poor snacking behaviour, and the importance of following a regular meal pattern.

On the other hand, only around 5% of the students reported consuming fruits or vegetables during breakfast on a regular basis. Slightly more than one-third of the study participants reported consuming food items containing animal protein, such as eggs, either regularly or 2-3 times a week. Similar to the above results, Rodríguez L et al., in their study among Mexican children and adolescents, also reported low consumption of fruits and vegetables during breakfast among all participants [24]. The fruit and vegetable intake is insufficient in young adults, and this pattern could continue later in life and even be passed on to the next generations through family eating habits [25]. It is recommended to promote the consumption of a wider variety of food, along with other lifestyle factors, to maintain health.

The present study demonstrated a significant association between breakfast habits and academic performance. Good to excellent performance was more frequent in habitual breakfast eaters compared to the skippers. Additionally, a statistically significant difference in the aggregate marks obtained in the terminal university exam was also observed, with regular breakfast eaters outscoring the skippers. These findings were consistent with those reported by Gajre NS et al., in their study among school children. Children in the regular breakfast group obtained higher marks compared to the no breakfast group. Regular breakfast eaters also performed better in the letter cancellation test and task of immediate memory [26]. Similar results have been reported by other studies, which also showed the beneficial effect of eating a daily breakfast in children and adolescents [27].

These findings can be partly explained by the enhancement of cognitive functioning through regular consumption of breakfast. In fact, it has been noted that consuming a daily breakfast has a positive effect on memory and attention span, which might, in turn, influence academic performance [28]. Improvement in school attendance alone could also contribute to better academic

performance, as it exposes students to a learning environment for a longer period. Some studies aimed at evaluating the effects of School Breakfast Programme (SBP) on scholastic achievements have reported significantly increased school attendance. School feeding programmes act as an incentive for parents to send their children to school [29,30].

The present study was one of the few conducted in college-going students, especially in the context of the Indian population, that assessed breakfast habits and their influence on academic performance. A homogenous population and a large sample size that was adequately powered strengthened the study.

Limitation(s)

The present study involved undergraduate students from a single institute, thereby limiting the generalisability of the findings to a larger population. Additionally, the presence of recall bias or memory errors in reporting breakfast habits cannot be ruled out. Furthermore, the association between breakfast habits and academic performance could have been influenced by potential confounding variables, such as gender, physical activity levels, lifestyle factors, among others, which were not controlled for.

CONCLUSION(S)

Breakfast skipping or irregular consumption is quite prevalent among university students. Time constraints emerge as the foremost reason for these breakfast habits. A significant association was found between breakfast eating habits and academic performance, but this finding could have been influenced by multiple potential confounders that were not controlled for in current study. The present study will stimulate interest in a greater characterisation of university students from different courses and genders. The role of potential variables affecting academic performance will be explored using a multivariate approach.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Physiology, SHKM Government Medical College, Nuh, Haryana, India.
2. Demonstrator, Department of Physiology, SHKM Government Medical College, Nuh, Haryana, India.
3. Demonstrator, Department of Physiology, SHKM Government Medical College, Nuh, Haryana, India.
4. Associate Professor, Department of Physiology, KCGMC, Karnal, Haryana, India.
5. Associate Professor, Department of Blood Bank, SHKM Government Medical College, Nuh, Haryana, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Navneet Kumar Kaushik,
Assistant Professor, Department of Physiology, SHKM Government Medical College, Nuh-122107, Haryana, India.
E-mail: navneetkk24@gmail.com

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