Research Article

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Impact of Breakfast Skipping and Choices on The Nutrient Intake and BMI of University Hostel Students of Lahore

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ABSTRACT: This longitudinal study aimed to investigate the food choices of university hostel students and explore the relationship between breakfast skipping, food choices, nutrient intake, and BMI. Data were collected from students residing in university hostels over a three-month period, with monthly assessments. The study included 306 students divided into breakfast-skippers and breakfast-eaters (control group), each comprising 153 students. Further categorization was performed among the breakfast eaters. A valid assessment questionnaire was used, encompassing social demographic characteristics, anthropometric measures, lifestyle assessment, dietary assessment through 24-hour dietary recall, and food composition table analysis. Among breakfast skippers, 15% were classified as obese and 13.7% as overweight, which was higher compared to other groups. Among the non-cereal-based breakfast eaters, 14.4% were obese, and 21% were overweight. The cereal-based breakfast eaters had the lowest rates of obesity and overweight, with 6.4% falling into each category. Significant differences were observed in calorie consumption and the intake of micronutrients across different breakfast categories. This study provided strong evidence linking breakfast skipping to a higher BMI (26.2 vs 24.1) and age-related patterns, with more breakfast skippers among younger individuals. Non-cereal-based breakfasts had a superior nutrient intake, while breakfast skippers had more screen time and insufficient sleep. Emotional states as triggers for binge eating were reported.

Keywords: breakfast skipping, BMI, cereal, micronutrients, university hostel students

INTRODUCTION

Each year, at least 2.8 million people die because of being overweight or obese. Furthermore, several additional diseases like diabetes, cardiovascular disease, and cancer are brought on by obesity (WHO, 2021). Adolescents undergo significant life transitions. The habits they develop throughout these years may persist into adulthood (Katsoulis *et al*., 2021). Because hostlers considered fast food to be more convenient, easily accessible, and affordable than fruits and nuts, they consumed more fast food than they did fruits and nuts (Joshi & Kushwaha, 2019). Healthy habits should be promoted during adolescence as they are crucial for preventing the start of non-communicable diseases. Researchers highlight how behavioral factors, particularly those related to diet, physical activity, and sedentary behavior, play a part in the etiology of obesity in teenagers (Forkert *et al*., 2019). Diverse sampling and obesity measurement approaches likely contributed to result variations. However, the link between breakfast, obesity, and confounding factors like socioeconomics, home environment, and lifestyle behaviors is widely acknowledged (Mounayar *et al*., 2019).

Breakfast was described as "the first meal of the day (Koca *et al*., 2017) that breaks the fasting status after the longest period of sleep, consumed within 2 to 3 hours of waking; and it can be consumed anywhere" (Giménez-Legarre *et al*., 2020). Breakfast skippers had lower energy, protein, carbohydrates, dietary fiber, calcium, and iron intakes, while higher fat and sodium intakes were observed in them (Abbasi *et al*., 2019). By releasing hormones such as ghrelin leptin, cholecystokinin, glucose-dependent insulin tropic polypeptide, glucagon-like peptide, and peptide YY, skipping breakfast has an impact on the appetite regulation system of the human body (Mohiuddin, 2018). Regular breakfast skipping is linked to increased adiposity or body mass index (BMI), which increases the risk of developing cardiometabolic diseases and diabetes mellitus due to increased resistance, fatigue at noon, altered behavior or altered cognitive performance (memory), and increased behavior (Fatima *et al*., 2019).

Cohort studies connect whole grains to lowering the risk of developing type 2 diabetes, digestive system cancers, and cardiovascular disease (CVD) (Reynolds *et al*., 2019). International nutrition guidelines encourage consuming whole grains instead of processed grains, which largely include endosperm starch (Masterson & Care, 2023). Because bran and germ have a rich nutritional profile (Black, 2022). Whole grains are a significant source of phytochemicals and antioxidants. These compounds have

been linked to a lower risk of cardiovascular disease, type 2 diabetes, and some malignancies (Marshall *et al*., 2020). Whole grain cereals are generally higher in dietary fiber compared to refined cereals. Fiber increased feelings of fullness and satiety. Consuming whole-grain cereals can help control hunger and reduce overall caloric intake, supporting weight management (Brandhorst & Longo, 2019).

This study aimed to investigate the relationship between breakfast consumption, specifically breakfast choice (non-cereal based vs. cereal), and its links to nutritional consumption and the anthropometric measurements among university hostel students.

MATERIALS AND METHOD

This longitudinal study was conducted in the University of Veterinary and Animal Sciences Hostel, Lahore. The data was collected thrice from the population. The study sample consisted of 306 students, equally divided between males and females, aged 20 to 30 years old. These students were further categorized into smaller age groups: 20-22, 23-25, 26-28, and 29-30. The participants did not receive any special treatments before the testing process. This sample size was calculated by using RAO software. Students with severe disease conditions, GIT problems, and those students following a special diet were excluded. The study population was divided into two groups. The study included 306 students aged 20-30 years, equally divided between males and females. Participants were categorized into three groups: “Breakfast Skippers” (N=153), “Breakfast Eaters” who consumed cereal-based breakfasts (N=77), and “Breakfast Eaters” who consumed non-cereal-based breakfasts (N=76). No pre-testing treatments were administered.

Descriptions of breakfast categories

The study classified adults into four distinct groups based on their breakfast consumption habits. The "Breakfast Skippers" were individuals who did not consume any energy-containing food or beverages between 5:00 am and 9:00 am, as reported in two out of three 24-hour dietary recall interviews. The "Breakfast Eaters" were adults with energy-containing meals or beverages during breakfast, as reported in two of the three recall interviews. The "Cereal Consumers" were adults who specifically included cereal as part of their breakfast, regardless of other food choices. Lastly, the "Non-Cereal Consumers" were adults who did not consume any cereal at breakfast, as their cereal intake was recorded as zero grams in all recall interviews.

Conduct of study

Before beginning the study, approval from the Institutional Review Committee for Biomedical Research (Approval No. 230/IRC/BMR dated 19.01.2023) was secured. Confidentiality was guaranteed, and the participants were made aware of the purpose and extent of the study. All study participants provided written informed consent. The entire process was finished in two steps: each study participant filled out a pre-tested, standardized questionnaire, and then they all had their anthropometric measures taken.

Questionnaire

With the help of subject-matter specialists, a pre-tested semi-structured questionnaire was created based on earlier research investigations (Oladapo Adenike *et al*., 2014). It was designed to gather data on demographics, breakfast habits, and related factors, respondents' nutritional status, and respondents' intake of nutrients based on a 72-hour food recall.

Anthropometric measurements

The standard definition of BMI is weight in kilograms per square meter (kg/m^2). BMI was determined using the same formula, but for the population in my study, I used WHO BMI ranges for the Asia-Pacific population.

BMI

Weight and height were obtained by surveys, and using the BMI formula, we classified the data in accordance with the WHO Asia-Pacific BMI ranges. Underweight BMI of 18.5, Normal BMI of 18.5-22.9, Overweight BMI of 23-24.9, and Obese BMI equal to and greater than 25.

Food composition table

A computer-based, standardized 24-hour dietary recall system was employed to collect information on participants' food, beverage, and supplement intake. This data, along with food composition tables from the USDA, allowed for the assessment of macronutrients and micronutrients in their diets. Physical activity and sedentary behaviors were assessed through a survey, with participants reporting their daily activity levels. Physical activity intensity was evaluated using METs.

Statistical analysis

SPSS (Version 22.0, IBM) was used for the statistical analysis of data. Descriptive analysis was also used. Mean and standard deviation values of continuous variableswere reported. Comparison of nutrient intake between categories of breakfast (cereal or non-cereal based) was analyzed by ANOVA models. One-way

Table 1. Socio-demographic characteristics of study subjects

Variables	Breakfast Skippers	Cereals based Breakfast Eaters	Non-Cereals-based breakfast eaters	
	N=153	N=77	N=76	
	Mean ± SD	Mean ± SD	Mean ± SD	
Age(years)	22.4 ± 2.8	23.6 ± 3.5	23.0 ± 3.2	
Weight(kg)	59.5 ± 10.9	57.3 ± 11.1	59.4 ± 10.5	
Height (ft.)	5.5 ± 0.4	5.5 ± 0.4	5.4 ± 0.3	
	n (%)	n (%)	n (%)	Total (100%)
Gender				
Male	77.0 (50.4%)	38.0 (24.8%)	38.0 (24.8%)	153.0 (100.0%)
Female	76.0(49.7%)	39.0 (25.5%)	38.0 (24.8%)	153.0 (100.0%)
Economic status				
Lower	6.0 (66.7%)	0.0	3.0 (33.3%)	9.0 (100.0%)
Middle	135.0 (53.1%)	64.0 (25.2%)	55.0 (21.7%)	254.0 (100.0%)
Upper	12.0 (27.9%)	13.0 (30.2%)	18.0 (41.9%)	43.0 (100.0%)

analysis of variance (ANOVA) was used to compare more than two quantitative variables with the Tukey post-hoc test. A p-value ≤ 0.05 was considered statistically significant.

RESULT

The current research study comprised a total of 306 university hostel students. Among this sample, the mean age of individuals who skipped breakfast was 22.4 years, with a standard deviation of 2.8 years. Cereal-based breakfast eaters have the highest mean age (23.6 years), while breakfast skippers have the lowest (22.4 years). Breakfast skippers have the highest mean weight (59.5 kg), while cereal-based breakfast eaters have the lowest (57.3 kg). There was not much variation in mean height among the groups, with all three groups having similar mean heights. Within the group of Breakfast Skippers, there were 77 male individuals, constituting 50.4% of the group, and 76 female individuals, making up 49.7% of the group.

Similarly, among cereal-based breakfast eaters, there were 38 male individuals, comprising approximately 24.8% of the group, and 39 female individuals, accounting for approximately 25.5% of the group. For non-cereal breakfast eaters, there were 38 male individuals, approximately 24.8% of the group, and 38 female individuals, also approximately 24.8% of the group. The economic status of the participants was categorized into three groups: lower, middle, and upper. In the breakfast skippers group, six individuals, or 66.7% of the group, were classified as having a Lower economic status. Additionally, 135 individuals, constituting 53.1% of the group, had a Middle economic status, and 12 individuals, making up 27.9% of the group, had an Upper economic status (Table 1).

The percentage of breakfast skippers appears to decrease with age. In the 20-22 age group, a relatively high percentage skips breakfast (57.1%), but this percentage decreases in the 23-25 and 29-30 age groups. The preference for cereal-based breakfast varies across age groups. It is relatively lower among individuals aged 26-28 (6.7%) but higher in the 23-25 and 29-30 age groups. The preference for cereal-based breakfast varies across age groups. It's relatively lower among individuals aged 26-28 (6.7%) but higher in the 23-25 and 29-30 age

Table 2. Descriptive characteristics among university hostel students with respect to age ranges.

Age (years)	Breakfast categories			Total
	Breakfast skippers (N=153)	**Cereal based Breakfast eaters (N=77)**	**Non-cereal based Breakfast eaters**	
20-22	109.0 (57.1%)	38.0 (19.9%)	44.0 (23.0%)	191.0 (100.0%)
23-25	21.0 (38.9%)	19.0 (35.2%)	14.0 (25.9%)	54.0 (100.0%)
26-28	7.0 (46.6%)	1.0 (6.7%)	7.0 (46.7%)	15.0 (100.0%)
29-30	16.0 (34.8%)	19.0 (41.3%)	11.0 (23.9%)	46.0 (100.0%)
Total	153.0 (50.0%)	77.0 (25.2%)	76.0 (24.8%)	306.0 (100.0%)

groups. The preference for non-cereal-based breakfast also shows variation among age groups. It's higher in the 26-28 age groups (46.7%) but relatively lower in the 29-30 age groups (Table 2).

Out of 153 breakfast skippers, 23 were obese, and 21 were overweight, more than other groups, followed by non-cereal-based breakfast eaters in which 11 participants were obese, and 16 were overweight out of 76, and least 5 obese and 5 overweight participants in cereal-based breakfast eaters out of 77 participants.

A relatively high percentage (56.2%) of breakfast skippers have genetic obesity. A lower percentage (18.8%) of cereal-based breakfast eaters have genetic obesity. Non-cereal-based breakfast eaters also have a significant percentage (25.0%) of genetic obesity. 63.2% of breakfast skippers, only 10.5% of cereal-based breakfast eaters, and 26.3% of non-cereal-based breakfast eaters who engage in binge eating report Anger as a trigger. Among individuals who report “sadness” as a trigger for binge eating, 52.0% are breakfast skippers, 12.0% are Cereals-based breakfast eaters, and 36.0% are Non-Cereals-based breakfast eaters. Among individuals who report Boredom as a trigger for binge eating, 56.3% are breakfast skippers, 18.7% are Cereals-based breakfast eaters, and 25.0% are Non-Cereals-based breakfast eaters. Among individuals who report Happiness as a trigger for binge eating, 43.1% are breakfast skippers, 32.8% are Cereals-based breakfast eaters, and 24.1% are Non-Cereals-based breakfast eaters. Among individuals who do not report binge eating 44.8% are breakfast skippers, 24.7% are Cereals-based breakfast eaters and 30.5% are Non-Cereals-based breakfast eaters.

Breakfast skippers have the highest percentage (55.6%) of individuals with four or more than 4 hours of screen time. Cereal-based breakfast eaters have a more balanced distribution of screen time, with 28.0% having less than 2 hours of screen time and 25.6% having four or more than 4 hours of screen time. Non-cereal-based breakfast eaters have the highest percentage (43.0%) of individuals with 2 to 3 hours of screen time. Breakfast skippers had 64.9% reporting less than 5 hours of sleep, indicating that a significant portion of this group experiences insufficient sleep. Cereal-based breakfast eaters had 28.1% reporting 5 to 7 hours of sleep, suggesting a more balanced sleep duration. Non-cereal-based breakfast eaters had 21.6% reporting less than 5 hours of sleep, which is similar to breakfast skippers, and 28.1% reporting 5 to 7 hours of sleep (Table 3).

Among the "Breakfast Skippers" group (N=153), 46% had breakfast on the day of the study, and 83% skipped breakfast. Among the "Cereals-based breakfast eaters" group (N=77), 38% had breakfast, and 8% skipped. Among the "Non-Cereals-based breakfast eaters" group (N=76), 36% had breakfast, and 9% skipped. In the "Breakfast Skippers" group, 88% skipped breakfast due to a lack of time, 70.8% because they weren't hungry, and 78.6% because they didn't like it. In the "Breakfast Skippers" group, 48.1% are willing to have ready-to-eat breakfast, while 56% are not. In the other two groups, the majority are willing to have ready-to-eat breakfast. In the "Breakfast Skippers" group, 44.1% have dinner early, and 59.3% have dinner late. In the other two groups, a higher percentage has dinner early. Across all groups, the most common frequency of eating at restaurants is "A couple of times every week." The "Cereals-based breakfast eaters" group has the highest percentage of individualswho eat at restaurants once a day. The "Cereals-based breakfast eaters" group mainly consumes whole grain cereals (22.0%).

Table 3. Health and lifestyle choices of university hostel students

Variables	Breakfast Skippers N=153 n (%)	Cereals based Breakfast Eaters N=77 n (%)	Non-Cereals-based breakfast eaters N=76 n (%)	Total
Nutritional Status				
Under-weight	31.0 (50.8%)	20.0 (32.8%)	10.0 (16.4%)	61.0 (100.0%)
Normal	78.0 (47.6%)	47.0 (28.7%)	39.0 (23.7%)	164.0 (100.0%)
Over-Weight	21.0 (50.0%)	5.0 (12.0%)	16.0 (38.0%)	42.0 (100.0%)
Obese	23.0 (59.0%)	5.0 (12.8%)	11.0 (28.2%)	39.0 (100.0%)
Genetic Obesity				
Yes	27.0 (56.2%)	9.0 (%18.8)	12.0 (25.0%)	48.0 (100.0%)
No	125.0 (48.6%)	68.0 (26.5%)	64.0 (24.9%)	257.0 (100.0%)
Binge Eating				
Anger	12.0 (63.2%)	2.0 (10.5%)	5.0 (26.3%)	19.0 (100.0%)
Sadness	13.0 (52.0%)	3.0 (12.0%)	9.0 (36.0%)	25.0 (100.0%)
Boredom	18.0 (56.3%)	6.0 (18.7%)	8.0 (25.0%)	32.0 (100.0%)
Happiness	25.0 (43.1%)	19.0 (32.8%)	14.0 (24.1%)	58.0 (100.0%)
No binge eating	85.0 (44.8%)	47.0 (24.7%)	58.0 (30.5%)	190.0 (100.0%)
Screen Time				
Less than 2 hrs	12.0 (48.0%)	7.0 (28.0%)	6.0 (24.0%)	25.0 (100.0%)
2 to 3 hours	25.0 (34.7%)	16.0 (22.3%)	31.0 (43.0%)	72.0 (100.0%)
4 or more than 4 hrs	115.0 (55.6%)	53.0 (25.6%)	39.0 (18.8%)	207.0 (100.0%)
Sleep Time				
Less than 5 hrs	24.0 (64.9%)	5.0 (13.5%)	8.0 (21.6%)	37.0 (100.0%)
5 to 7 hrs	75.0 (43.8%)	48.0 (28.1%)	48.0 (28.1%)	171.0 (100.0%)
More than 7 hrs	54.0 (55.1%)	24.0 (24.5%)	20.0 (20.4%)	98.0 (100.0%)
Exercise				
No activity	62.0 (47.3%)	34.0 (26.0%)	35.0 (26.7%)	131.0 (100.0%)
Less than 30 min per day	55.0 (50.5%)	30.0 (27.5%)	24.0 (22.0%)	109.0 (100.0%)
30 to 60 min per day	23.0 (56.1%)	7.0 (17.1%)	11.0 (26.8%)	41.0 (100.0%)
More than 60 min per day	13.0 (52.0%)	6.0 (24.0%)	6.0 (24.0%)	25.0 (100.0%)

The "Breakfast Skippers" and "Non-Cereals-Based Breakfast Eaters" groups have a mix of whole and refined grain cereal consumption. In all groups, "Sugary" dessert and beverage consumption is more common. “Cereals-based breakfast eaters" group has the highest percentage of individuals consuming sugary options. Among the protein sources, "Chicken" is the most commonly consumed type in all groups. “Eggs" are also a common protein source in all groups.

The "Breakfast Skippers" group has a higher percentage of individuals who consume "Beef." (Table 4). For calories, carbohydrates, fats, dietary fiber, zinc, iron, and

Table 4. The dietary habits of university hostel students

Variables	Breakfast Skippers N=153 n (%)	Cereals based Breakfast Eaters N=77 n (%)	Non-Cereals-based breakfast eaters N=76 n (%)	Total (100%)
Today's Breakfast				
Eat	46.0 (26.0%)	67.0 (37.9%)	64.0 (36.1%)	177.0 (100.0%)
Skip	107.0 (82.9%)	10.0 (7.8%)	12.0 (9.3%)	129.0 (100.0%)
Reason of skipping Breakfast				
Lack of time	81.0 (88.0%)	5.0 (5.4%)	6.0 (6.5%)	92.0 (100.0%)
Not hungry	17.0 (70.8%)	3.0 (12.5%)	4.0 (16.7%)	24.0 (100.0%)
Does not like it	11.0 (78.6%)	2.0 (14.3%)	1.0 (7.1%)	14.0 (100.0%)
Does not skip	44.0 (25%)	67.0 (38.1%)	65.0 (36.9%)	176.0 (100.0%)
Breakfast Type				
Cereal	97.0 (55.7%)	77.0 (44.3%)	0.0 (0.0%)	174.0 (100.0%)
Non-Cereal	56.0 (42.4%)	0.0 (0.0%)	76.0 (57.6%)	132.0 (100.0%)
Ready to eat Breakfast				
Yes	111.0 (48.1%)	56.0 (24.2%)	64.0 (27.7%)	231.0 (100.0%)
No	42.0 (56.0%)	21.0 (28.0%)	12.0 (16.0%)	75.0 (100.0%)
Dinner				
Early	83.0 (44.1%)	58.0 (30.9%)	47.0 (25%)	188.0 (100.0%)
Late	70.0 (59.3%)	19.0 (16.1%)	29.0 (24.6%)	118.0 (100.0%)
Eating at Restaurants				
Once a day	27.0 (52.9%)	13.0 (25.5%)	11.0 (21.6%)	51.0 (100.0%)
Couple of times every week	60.0 (50.8%)	30.0 (25.5%)	28.0 (23.7%)	118.0 (100.0%)
Couple of times per month	58.0 (47.5%)	34.0 (27.9%)	30.0 (24.6%)	122.0 (100.0%)
Never	8.0 (53.3%)	0.0 (0.0%)	7.0 (46.7%)	15.0 (100.0%)
Cereal Type				
Whole Grains	94.0 (54.7%)	38.0 (22.0%)	40.0 (23.3%)	172.0 (100.0%)
Refined Grains	59.0 (44.0%)	39.0 (29.1%)	36.0 (26.9%)	134.0 (100.0%)
Dessert and Beverages				
Sugary	112.0 (73.2%)	23.0 (15.0%)	18.0 (11.8%)	153.0 (100.0%)
Sugar Free	55.0 (71.4%)	9.0 (11.7%)	13.0 (16.9%)	77.0 (100.0%)
None	57.0 (75.0%)	8.0 (10.5%)	11.0 (14.5%)	76.0 (100.0%)
Protein Type				
Beef	1.0 (100.0%)	0.0 (0.0%)	0.0 (0.0%)	1.0 (100.0%)
Mutton	3.0 (60%)	0.0 (0.0%)	2.0 (40%)	5.0 (100.0%)
Eggs	55.0 (46.2%)	32.0 (26.9%)	32.0 (26.9%)	119.0 (100.0%)
Lentils	3.0 (37.5%)	4.0 (50%)	1.0 (12.5%)	8.0 (100.0%)
Chicken	87.0 (52.4%)	39.0 (23.5%)	40.0 (24.1%)	166.0 (100.0%)
Fish	0.0 (0.0%)	0.0 (0.0%)	1.0 (100.0%)	1.0 (100.0%)
None	4.0 (66.7%)	2.0 (33.3%)	0.0 (0.0%)	6.0 (100.0%)

magnesium, the *p*-values are greater than 0.05 ($p > 0.05$). This suggests that there is no significant difference in the intake of these nutrients among the different breakfast categories. In other words, the type of breakfast doesn't seem to have a significant impact on the intake of these nutrients. The *p*-value is 0.2 for protein, which is greater than 0.05, so there is no significant difference in protein intake based on breakfast categories. For vitamin B12, vitamin A, vitamin D, and Calcium, the *p*-values are less than or equal to 0.05 ($p \leq 0.05$). This indicates that there

Table 5. ANOVA comparison of nutrient intake of university hostel students by breakfast categories

Nutrients	F	Sig.
Calories	3.0	0.1
Carbohydrates	2.7	0.1
Proteins	1.6	0.2
Fats	2.5	0.1
Dietary Fiber	1.6	0.2
Vit B_{12}	9.5	0.0
Vit A	3.2	0.0
Vit D	17.5	0.0
Zinc	0.4	0.1
Iron	0.3	0.1
Calcium	9.7	0.0
Magnesium	2.4	0.1
Potassium	163.3	0.0

ANOVA comparison *p*-value

are statistically significant differences in the intake of these nutrients among the different breakfast categories. For vitamin B12, vitamin A, and vitamin D, the *p*-values are very close to 0 ($p \approx 0$), which suggests a strong association between breakfast categories and the intake of these vitamins. For Calcium, the *p*-value is 0.0, indicating a highly significant difference. The *p*-value for potassium is 0.0, which means there is an extremely significant difference in potassium intake among the breakfast categories (Table 5).

Non-cereals-based breakfast eaters consume significantly more calories (1682.8 kcal/day) than Breakfast Skippers (1391.5 kcal/day) and Cereals-Based Breakfast Eaters (1475.9 kcal/day). Non-Cereals-Based Breakfast Eaters consume significantly more carbohydrates (183.2 g/day) than Breakfast Skippers (155.6 g/day) and Cereals-Based Breakfast Eaters (154.5 g/day). Non-Cereals-Based Breakfast Eaters consume significantly more proteins (69.7 g/day) than Breakfast Skippers (63.7 g/day) and Cereals-based breakfast eaters (67.7 g/day). Non-cereals-based breakfast eaters consume significantly more fats (60.8 g/day) than Breakfast Skippers (52.76 g/day) and Cereals-based breakfast eaters (57.2 g/day). Breakfast Skippers consume significantly more dietary fiber (19.43 g/day) than both Non-Cereals-based breakfast eaters (16.8 g/day) and Cereals-based breakfast eaters (16.2 g/day). Non-cereals-based breakfast eaters have a significantly higher intake of Vitamin B12 (2.5 ug/day) compared to Breakfast Skippers (1.1 ug/day) and Cereals-based breakfast eaters (1.8 ug/day) (Table 6).

DISCUSSION

The study sought to explore the relationship between skipping breakfast, nutrient consumption, and body mass index (BMI) among university hostel students. The current research undertaken among university hostel students revealed that Breakfast skipping was associated with a higher mean BMI of 26.2, while breakfast consumers had a lower mean BMI of 24.1, indicating a significant link between skipping breakfast and increased weight status. These findings were in line with some previous studies that stated breakfast skipping is associated with a higher BMI and an increased risk of excess body weight. Individuals who regularly skip breakfast tend to have a higher body weight compared to those who consume breakfast regularly (Mesas *et al*., 2012). Our study found that cereal-based breakfast eaters had the lowest number of obese and overweight participants, with five individuals falling into each category. This group had the lowest prevalence of obesity and overweight participants among the three breakfast groups. These results inclined with the previous studies that showed the role of dietary fiber, often found in whole-grain cereals, in body weight regulation and its potential benefits in weight management (Pereira and Ludwig 2001 Violette *et al*., 2016; Williams, 2014).

This study indicated that the percentage of breakfast skippers decreases with age. This finding was consistent with some previous research that suggested younger individuals are more likely to skip breakfast. Older adolescents tend to have a better understanding of the nutritional benefits of breakfast, while younger adolescents may not possess the same level of awareness and may not fully appreciate the importance of breakfast (Fayet-Moore *et al*., 2017). Previous studies collectively showed that breakfast skipping tends to be more prevalent among children and young adolescents (Kral *et al*., 2010; Rampersaud *et al*., 2005; Smith *et al*., 2017). This study showed that Breakfast skippers have a high percentage of overweight and obese individuals. These findings were in line with some previous studies that had linked skipping breakfast or consuming less healthy breakfast options to higher body weight. Skipping breakfast may lead to overeating later in the day, potentially contributing to weight gain. The study found that breakfast skipping in children and adolescents was associated with unhealthy weight status and inadequate nutrient intake (Deshmukh-Taskar *et al*., 2010). This study identified a significant percentage of breakfast skippers with genetic obesity and linked it to certain triggers for binge eating, such as anger

Table 6. ANOVA- Tukey post-hoc test comparison of nutrient intake between breakfast groups

Energy and Nutrients intake	Breakfast Skippers N=153 Mean ± SD	Cereals based Breakfast Eaters N=77 Mean ± SD	Non-Cereals-based breakfast eaters N=76 Mean ± SD
Calories (kcl/day)	1391.5 ± 814.5	1475.9 ± 814.5	1682.8 ± 1264.9
Carbohydrates (g/day)	155.6 ± 76.4	154.5 ± 63.8	183.2 ± 112.1
Proteins (g/day)	63.7 ± 36.5	67.7 ± 35.8	69.7 ± 28.4
Fats (g/day)	52.76 ± 24.8	57.2 ± 27.9	60.8 ± 27.8
Dietary Fiber (g/day)	19.43 ± 12.8	16.2 ± 7.5	16.8 ± 8.8
Vit B12 (ug/day)	1.1 ± 1.0	2.5 ± 0.8	1.8 ± 1.1
Vit A (ug/day)	388.0 ± 295.8	449.6 ± 295.9	467.1 ± 304.3
Vit D (IU/day)	45.3 ± 25.3	91.7 ± 80.9	106.9 ± 94.9
Zinc (mg/day)	6.7 ± 1.9	5.1 ± 2.1	5.4 ± 2.0
Iron (mg/day)	10.7 ± 1.8	9.5 ± 5.1	9.6 ± 3.5
Calcium (mg/day)	323.8 ± 289.8	428.4 ± 298.7	512.0 ± 370.6
Magnesium (mg/day)	162.3 ± 83.7	183.3 ± 78.0	182.3 ± 78.1
Potassium (mg/day)	1302.65 ± 150.1	1395.4 ± 763.8	1347.3 ± 688.2

ANOVA comparison $p \leq 0.05$

and sadness. The relationship between breakfast skipping, genetic obesity, and emotional states like sadness and anger is complex and influenced by various genetic, environmental, and psychological factors. Research in this area had not examined these specific causal connections. In this study, breakfast skippers had a higher percentage of individuals with over 4 hours of screen time, and they also reported insufficient sleep. Previous research has suggested that excessive screen time and inadequate sleep can be associated with unhealthy dietary habits and weight gain (Chaput *et al*., 2016; Chaput *et al*., 2007; WY *et al*., 2011; Zhang *et al*., 2011). The study indicated significant differences in the intake of certain nutrients, particularly vitamins (vitamin B12, vitamin A, vitamin D) and calcium, based on breakfast categories.

This study showed that non-cereal-based breakfast eaters generally had a more balanced nutrient intake compared to breakfast skippers and cereal-based breakfast eaters because of regular milk consumption in breakfast and due to the variety of food selections in breakfast. These findings suggested that the type of breakfast can impact nutrient intake, which is consistent with existing research examining the relationship between breakfast consumption and nutrient intake in a Canadian population aged 4 to 18 years. The study found that children and adolescents who consumed breakfast had higher daily nutrient intakes compared to breakfast skippers (Coulthard *et al*., 2017). The study investigated the effects of breakfast consumption on appetite, energy intake, and metabolic responses throughout the day in habitual breakfast eaters. The results showed that a balanced and nutrient-dense breakfast led to better appetite control and reduced overall energy intake. Such breakfasts may often include non-cereal choices and provide essential nutrients (Astbury *et al*., 2011).

CONCLUSION

This study provides compelling evidence linking breakfast skipping to higher BMI and poor nutrient profiles among students. Breakfast skipping was associated with a higher mean BMI of 26.2, while breakfast consumers had a lower mean BMI of 24.1, indicating a significant link between skipping breakfast and increased weight status. The percentage of breakfast

skippers was notably higher among younger individuals, with 57.1% in the 20-22 age group, gradually decreasing in the 23-25 and 29-30 age groups. This suggests an age-related pattern in breakfast habits. Non-cereal-based breakfasts were quantitatively superior in nutrient intake, with higher levels of vitamins (vitamin B12, vitamin A, vitamin D) and calcium. Breakfast skippers had a higher percentage of individuals with over 4 hours of screen time, potentially indicating a sedentary lifestyle. Breakfast skippers also reported insufficient sleep, with 64.9% having less than 5 hours of sleep. This highlights a potential impact on overall health, as adequate sleep is essential. While emotional states like anger and sadness were reported as triggers for binge eating among breakfast skippers, no direct quantitative causal link was established between breakfast habits, genetic obesity, and these emotional states.

RECOMMENDATION

By identifying and targeting individuals who skip breakfast, healthcare professionals, educators, and policymakers can develop strategies to address this issue and promote healthier eating habits. Such initiatives can have significant implications for reducing the prevalence of malnutrition, overweight, and obesity among young people.

LIMITATION

The theme of the study was the comparison between breakfast skippers, cereal-based breakfast eaters, and non-cereal-based breakfast eaters. To ensure fairness, an equal number of participants who skip breakfast and those who eat breakfast were included in the study. The study was unable to cover the prevalence of breakfast skipping in university hostel students and the relationship between gender and breakfast skipping, as the participants consisted of an equal number of males and females.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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