

A Study of Determinants of Obesity - Is Skipping Breakfast Meal a Risk Factor?

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ABSTRACT

BACKGROUND

Breakfast is an important meal since it refuels the body after long night fasting. Regular intake of breakfast must have favourable supply of both micronutrients and macronutrients to maintain a body mass index (BMI) in the normal range. Despite its importance, the rate of skipping breakfast is observed to be alarmingly increasing among medical students. Therefore, the present study was undertaken to understand the dietary patterns, and physical activity level, and analyse the association of skipping breakfast with obesity among medical students.

METHODS

A cross-sectional study was conducted among 174 medical undergraduate students aged between 18 and 23 years in a tertiary care teaching hospital from August 2019 to October 2019. A pretested, semi-structured, validated, self-administered questionnaire was used to assess the profile, physical activity, food consumption pattern, and perception about the importance of breakfast meal. Regression analysis was done. Odds ratio was calculated.

RESULTS

About 23.6 % and 27 % of the study participants were found to be overweight and obese respectively. Only 51.1 % of study participants were involved in physical activity. 17.2 % of medical students skipped their breakfast regularly and 71.6 % were aware that skipping breakfast would affect work efficacy and span of concentration. Age group of 22 – 23 years (OR: 19.5, 95 % CI: 2.08, 183.70) was significantly associated with obesity. Skipping breakfast (OR, 0.45, 95 % CI: 0.23, 0.90) was not found to be associated with obesity.

CONCLUSIONS

Our study found that more than one fourth participants were obese and one third were skipping breakfast daily or more than thrice a week. There was no association between obesity and skipping of breakfast meal. However, the importance of breakfast meal in a day cannot be ignored. Awareness programs to practice healthy eating habits might help in prevention of obesity and overweight among students.

KEY WORDS

Breakfast, Exercise, Obesity, Body Mass Index, Students, Medical

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BACKGROUND

Universally breakfast is defined as the “the first meal of the day,” which is consistent with the etymology to “break” the “fast”. It is the “the first meal of the day” consumed within two hours of waking, before starting daily activities. According to American Heart Association report 2017, breakfast - consumers tend to have lower rates of heart disease, high blood pressure, and high cholesterol. However, skipping meals has become an increasingly popular part of modern life, especially among young adults.¹ Breakfast contains 20 % - 35 % of daily energy needs and is considered to be the most important meal of the day as part of a healthy balanced diet.^{2,3} Breakfast habits are significantly associated with physiological, psychological, and social health dimensions.⁴ Evidence shows that meal skipping rates are generally highest during young adulthood, a period of transition and development.⁵ Silliman et al. and Sakamaki et al. reported a high prevalence (24 % - 87 %) of meal skipping habit among young adult population.^{6,7} Other studies reported that the frequency of recurrent missed breakfast among different age groups was higher than lunch and dinner.^{8,9} Evidence showed statistically significant associations between breakfast skipping and fatigue at noon worsens memory and higher body mass index as well as increased prevalence of obesity - related chronic illness.¹⁰⁻¹² Skipping breakfast has a greater influence on both waist circumference and BMI than eating dinner within three hours before sleep.¹³ A strong and congruous relationship between breakfast skipping and obesity, but not overweight, reported among children in the south eastern European population.¹⁴ Medical students are prone to skip meal due to hectic schedule and exposed to various infections during clinical postings. To date, there have been few studies conducted to determine the effect of skipping meal among medical students as discussed above. However, until now to the best of our knowledge, no study has been conducted to assess the association of skipping breakfast with obesity and its determinants.

Objectives

- To assess the determinants of obesity among medical students, including skipping breakfast meal and understand the perception about the importance of breakfast meal.
- To understand the dietary patterns, physical activity level and analyse the association of skipping breakfast with obesity among medical students.

METHODS

A cross-sectional study was conducted among medical school students in a tertiary care teaching hospital of Chennai, Tamil Nadu, India, for a period of 3 months from August 2019 to October 2019. The study population consisted of first to final academic year medical students pursuing Bachelor of Medicine and Bachelor of Surgery (MBBS). Students who were ≥ 18 years of age and willing to participate in the study were included and studied. The students who could not be followed up after three attempts were excluded from the current study.

Ethical Considerations

The study was conducted after receiving approval from Institutional Ethics Committee. Written informed consent was obtained from all the participants prior to the start of the study. All personal identifying information was kept confidential.

Sample size Calculation

Sample size was calculated assuming the proportion of prevalence of obesity among medical school students as 30 % as per Boo NY et al.¹⁵ The other parameters considered for sample size calculation were 5 % absolute precision and 1.960 % confidence level. The following formula was used for sample size calculation as per Daniel WW et al.¹⁶

$$N = 4pq / d^2$$

Where n = Sample size

Z = Z statistic for a level of confidence level = 1.960

P = Expected prevalence / proportion of outcome = 0.3

d = Precision = 0.07

The required sample size as per the above mentioned calculation was 171.

The final sample size included in the study was 174.

Sampling

Stratified random sampling was done and 174 medical students were included from I to IV - year undergraduate class. The student's / study subjects were randomly selected by lottery method assigning numbers as per attendance roll numbers. Overall, 43 students were included from first and second year and 44 students were included from third and fourth year.

Study Tool

A pre tested, semi - structured questionnaire was used for data collection. The questionnaire was designed and validated by the authors of this study. At the initial phase of the study, a pilot testing was deployed with 10 % of the study population. The questionnaire had separate sections which included specific details about profile, anthropometry, physical activity pattern, food consumption pattern, and perception about the importance of the breakfast meal.

Statistical Analysis

Data was first entered into Microsoft excel Spread Sheet and after checking the normality, the data was analysed using STATA.¹³ Descriptive statistics were presented as percentages and Bivariate and multivariate regression analysis was done. Adjusted Odds ratio was calculated.

RESULTS

In the present study, 174 medical students were included. The majority of the study participants (63 %) were in 20 - 21 age group and females were more than males (63.8 % VS 36.2 %). The Mean (\pm SD) age was 19.9 years (\pm 0.90).

Variables	Frequency	Percentage		
Age group (in years)	18 - 19	59	34	
	20 - 21	109	63	
	22 - 23	6	3.4	
Gender	Male	63	36.2	
	Female	111	63.8	
Place of Residence	Hosteller	84	48.3	
	Day scholar	90	51.7	
Permanent Residence	City	135	78	
	Town	36	20.7	
	Village	3	1.7	
Religion	Hindu	150	86	
	Christian	16	9.2	
	Muslim	7	4	
	Jain	1	1.6	
Education of Father	Illiterate	3	1.7	
	Primary	1	0.6	
	High school	9	5.2	
	Higher secondary	12	6.9	
	Graduate	114	65.5	
Occupation of the father	Post Graduate	35	20.1	
	Unemployed	1	0.6	
	Unskilled	1	0.6	
	Semiskilled	3	1.7	
	Skilled	7	4.0	
	Clerk, Shop owner, farmer	73	42.	
	Semi - professional	51	29.3	
	Professional	38	21.8	
	Education of the mother	Illiterate	4	2.3
		Primary	3	1.7
High school		20	11.5	
Higher secondary		14	8	
Graduate		111	63.8	
Occupation of the mother	Post Graduate	22	12.6	
	Unemployed	114	65.5	
	Semiskilled	1	0.6	
	Skilled	9	5.2	
	Clerk, Shop owner, farmer	14	8.0	
	Semi - professional	11	6.3	
Type of family	Professional	25	14.4	
	Nuclear	157	90.2	
	Joint	17	9.8	

Table 1. Distribution of the Study Participants as per Socio-Demographic Characteristics (N = 174)

Variables	Frequency	Percentage (%)	
Involved in physical activity (N = 94)	Yes	89	51.2
	No	5	48.8
Frequency of moderate physical activity (N = 59)	Daily	16	27.1
	4 - 6 day / weeks	19	32.2
	2 - 3days / week	21	35.6
	One day / week	3	5.1
Duration involved in such physical activity (N = 59)	>1 hour / day	13	22
	45 - 60 mins / day	18	30.5
	30 - 45mins / day	21	35.6
	< 30mins / day	07	11.9
	Daily	5	17
Frequency of intense physical activity (N = 30)	4 - 6 days / weeks	8	27
	2 - 3days / week	6	20
	One day / week	11	36
	>1 hour / day	13	43
Duration involved in intense physical activity (N = 30)	45 - 60 mins / day	8	27
	30 - 45mins / day	4	13
	< 30mins / day	5	17

Table 2. Distribution of Study Participants According to Physical Activity. (N = 174)

The permanent residence of the majority of participants was city (78 %). Most of them (86 %) belonged to Hindu religion followed by 9.2 % Christian and 4 % Muslim. The majority (90.2 %) of study participants belonged to a nuclear family. (Table. 1)

Out of 174 study participants, nearly one third (27 %) were found to be obese (BMI > 25) as per Asia-Pacific perspective given by WHO. Nearly one fourth (23.6 %) were found to be overweight. Among the total study participants, 89 (51.2 %) were involved in some kind of physical activity. Out of 89 physically active students, more than half (66.3 %) were doing moderate physical activity and one third (33.7 %) were doing intense physical activity. (Table 2) Majority (61.5 %) of study participants took three main meals and 68.4 % had one snack regularly. More than half of the participants (68.4 %) & (59.2 %) had one serving of vegetables and fruits respectively. Nearly one third (31.6 %) participants skipped breakfast > 3 times / week or daily and 27.6 % participants were having junk food > 3 times / week or daily. (Table.3)

Among the study participants, 59.2 % showed health-conscious behaviour about food consumption occasionally. 162 (93.1 %) perceived that it is important to have breakfast and 145 (83.4 %) aspired to take breakfast regularly. The majority (87.9 %) knew that taking breakfast regularly influences the body functioning, physical and mental health. More than half (59.8 %) of the participants perceived skipping breakfast affected memory. (Table 4)

Variables	Frequency	Percentage	
Frequency of main meals (daily)	One	15	8.6
	Two	46	26.4
	Three	107	61.5
	Four	6	3.4
Frequency of snacks (daily)	One	119	68.4
	Two	43	24.7
	Three	8	4.6
	Four	4	2.3
Servings of vegetables (daily)	One	103	59.2
	Two	53	30.5
	Three	18	10.3
	Four	0	0
Servings of fruits (daily)	One	134	77
	Two	31	17.8
	Three	8	4.6
	Four	1	0.6
Skipping of breakfast (in a week)	Daily	30	17.2
	>3 days / week	25	14.4
	<3 days / week	54	31
	Not at all	65	37.4
Consumption of junk foods (in a week)	Daily	9	5.2
	>3 days / week	39	22.4
	<3 days / week	103	59.2
	Not at all	23	13.2
Consumption of chocolate / refined sugars (in a week)	Daily	26	14.9
	>3 days / week	27	15.5
	<3 days / week	90	41.7
	Not at all	31	17.8
Consumption of baked foods (in a week)	Daily	13	7.5
	>3 days / week	29	16.7
	<3 days / week	105	60.3
	Not at all	27	15.5
Consumption of soft drinks (in a week)	Daily	9	5.2
	>3 days / week	23	13.2
	<3 days / week	64	36.8
	Not at all	78	44.8
Consumption of dairy items (in a week)	Daily	22	12.6
	>3 days / week	42	24.1
	<3 days / week	84	48.3
	Not at all	26	14.9

Table 3. Distribution of Study Participants as per Food Consumption Pattern (N = 174)

Regression Applied

On bivariate regression analysis, the age group of 22 - 23 years (OR: 19.5, 95 % C.I.2.08, 183.70) was found to be significantly associated with obesity. Gender, place of residence, consumption of junk food, skipping of breakfast meal (> 3 times per week) (OR: 0.45, 95 % C.I.:0.23, 0.90) and physical activity levels were not found to be associated with obesity. (Table 5)

Perception about Breakfast		Frequency	Percentage
Health conscious behaviour about food consumption	Always	42	24.1
	Never	29	16.7
	Sometimes	103	59.2
Affects work efficacy / concentration if not consumed	Yes	126	71.8
	No	48	28.2
Breakfast meal is important to have regularly	Yes	162	93.1
	No	12	6.9
Influences body functioning, physical, mental health	Yes	153	87.9
	No	21	12.1
Feeling physically weaker when not consumed	Yes	129	74.2
	No	45	25.8
Skipping affects memory	Yes	104	59.8
	No	70	40.2
Skipping affects school attendance	Yes	76	43.7
	No	98	56.3
Skipping affects concentration	Yes	130	74.7
	No	44	25.3
Skipping affects physical activity	Yes	119	68.4
	No	55	31.6
Wish to have breakfast daily	Yes	145	83.4
	No	29	16.6

Table 4. Perception about Breakfast (N = 174)

Variables	Present No. (%)	Absent No. (%)	? Total N (%)	Crude Odds Ratio	Adjusted Odds Ratio
Skipping of Breakfast	Yes 23(21.1)	86(78.9)	109(100)	0.45(0.23, 0.90)	0.64(0.27, 1.50)
	No 24(36.9)	41(63.1)	65(100)	1	1
Age group	18 - 19 12(20.3)	47(79.7)	59(100)	1	1
	20 - 21 30(27.5)	79(72.5)	109(100)	1.48(0.69, 3.18)	1.68(0.73, 03.82)
	22 - 23 5(83.3)	1(16.7)	6(100)	19.5(2.08, 183.70)	16.82(1.56, 180.55)
Gender	Male 22(34.9)	41(65.1)	63(100)	1.84(0.93, 03.65)	2.02(0.93, 4.41)1
	Female 25(22.5)	86(77.5)	111(100)	1	1
Place of residence	Hosteller 17(20.2)	67(79.8)	84(100)	0.50(0.25, 1.01)	0.57(0.25, 1.30)
	Day scholar 30(33.3)	60(66.7)	90(100)	1	1
Taking Junk food	Yes 9(18.8)	39(81.2)	48(100)	0.53(0.23, 1.21)	0.53(0.21, 1.35)
	No 38(30.2)	88(69.8)	126(100)	1	1
Physical activity	Active 27(30.3)	62(69.7)	89(100)	1.41(0.72, 2.77)	1.34(0.64, 2.80)
	Inactive 20(23.5)	65(76.5)	85(100)	1	1
Type of family	Nuclear 39(24.8)	118(75.2)	157(100)	1	1
	Joint 8(47.1)	9(52.9)	17(100)	2.68(0.97, 7.44)	2.77(0.87, 8.74)

Table-5 Determinants of Obesity among Study Participants. (N = 174)

DISCUSSION

In the present study, we studied 174 undergraduate medical students with majority (63 %) belonging to the age group of 20 – 21 years and among them (63.8 %) were females. BMI was measured using Asia-Pacific guidelines by WHO^{17,18} for obesity. The prevalence of overweight (23.6 %) and obesity (27 %) was found to be higher in females compared to males. Our results corroborate with findings that were reported by Amruth M et al.¹⁹ where prevalence of overweight (18.2 %) and obesity (20.3 %) has been observed more among female medical students compared to males. Among medical students in Kerala, in which 18.2 % and 20.3 % belonged to overweight and obesity group respectively. Kumar CA et al. found that 9.5 % of medical students had obesity (BMI > 25) in a study done in Andhra Pradesh.²⁰ Similarly, Dhanuraja V et al. found that 8.4 % of medical students in Chennai had obesity (BMI > 25).²¹ In a study conducted in Delhi by Chhabra P et al. found that only two percent of medical students had obesity.²² In contrast, Gopal Krishnan S et al. found a lower prevalence of overweight (11.7 %) and obesity (2 %) among medical students in Malaysia.²³ This difference could be due to different study parameters used in the study such as sample size and study timeline. In this study, we also found that nearly half (51.1 %) of the participants were physically active and the majority (66.3 %) were engaged in moderate physical activity. Similar findings of physical activity pattern were reported by Amruth M et al. (54.5 %) and Gupta S et al. (46 %) among medical students.^{19,24}

Around sixty-one percent of the participants maintained proper three meals dietary pattern for the whole day.

Interestingly, 17.2 % participants were skipping breakfast daily, whereas 14.4 % participants were skipping breakfast for more than three days in a week. Our findings overlapped with that of Kumar CA et al.²⁰ and Amruth M et al.¹⁹ where they found that 44.2 % and 67.2 % of the participants were taking three meals daily respectively. However, Amruth et al.¹⁹ found a lower prevalence of daily breakfast skipping (2.3 %) and more than thrice per week breakfast skipping (3.4 %).¹⁹ Contrastingly, a higher proportion of skipping of breakfast was reported by Sofar SM et al. (87.6 %) and Manal Ahmad et al. (88.8 %).^{25,26} This strikingly different results could be due to differences in study settings, assessment methods, and sample size. Multivariate analysis showed that age group (22 – 23 years) (OR: 19.5, 95 % CI: 2.08, 183.70) was the only factor associated with obesity. Skipping breakfast (OR, 0.45, 95 % CI: 0.23, 0.90) was not associated with obesity. Our findings were similar to Manal Ahmad et al.²⁶ where they concluded that BMI had no relation with meals.

With regard to the importance and side effects of skipping breakfast, our findings contradict with Sofar SM et al. who found a lower level of awareness about the importance of breakfast (27.5 % mentioned about its benefits in improving and 4.9 % mentioned it directly help in physical activity) and its side effects of skipping it (19.6 %) among participants.²⁵

Despite our study and previous study²⁶ findings that no association was found between BMI and eating habits, it has been proven that skipping breakfast could cause not only low energy levels in the morning but also a decrease in total energy expenditure which can result in the development of obesity. In addition, skipping meals reduces overall calorie consumption and results in high blood sugar level. Breakfast is considered

to be an important meal for building immunity and keeping medical students away from infections in and around the hospital campus.

CONCLUSIONS

Our study found that more than one-fourth participants were obese and one thirds were skipping breakfast daily or more than thrice a week. There was no association between obesity and skipping of breakfast meal. However, the importance of breakfast meal in a day cannot be undermined. Awareness programs are tailored to prevent obesity and overweight among students to practice healthy eating habits.

Limitations

The present study had certain limitations like Hawthorne bias and Recall bias which might directly affect the study results. Our study used BMI criteria that is specific for the Asian population for classification of obesity, due to which the results may not be generalizable.

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

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