



## A cross-sectional study on the dietary factors and their association with body mass index among undergraduate medical students in a medical college

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### Abstract:

**Background:** The alarming rise in overweight and obesity among young adults which forms a key link to the upsurge of other non-communicable diseases like diabetes, hypertension, stroke and myocardial infarction is a major concern. These diseases though have a complex aetiology, can be easily prevented by adopting healthy dietary and lifestyle habits. Since behaviours are formed in the early years of life, this study assessed the dietary habits of medical students and its association with BMI. **Material and methods:** Cross sectional study which included all the students in a medical college. Data was collected using pre tested questionnaire from 613 students after taking informed consent. Height and weight of the students was measured and BMI was calculated. **Results:** Only 58.9% and 43.7% of the students consumed diet adequate in calories and proteins respectively. Female students' diet was more deficient in proteins (62.2% v/s 49.5%). Majority of the students snacked once a day (73%); junk food consumption was reported by 9.1% of the students daily. Approximately 56% students skipped meals; breakfast was the common missed meal. The prevalence of overweight and obesity was 8% and 1.5% respectively. Statistically significant association was found between BMI and age, MBBS academic years, calorie intake and meal skipping. **Conclusion:** Dietary habits of medical students in this study were found to be unhealthy and there was a significant association with BMI. There is a need to create awareness and interest regarding healthy diet and body weight management among this future physician population.

**Key words:** Dietary habits, medical students, skipping meals, BMI, overweight.

### Introduction

The burden of non-communicable diseases is increasing globally and poses a

major public health concern, a large part of which is preventable [1,2]. The rapid increase of overweight and obesity, especially in the younger generation, in many low and middle-income countries like India,

due to inappropriate diet and inactive lifestyle, foretells us overwhelming chronic disease burden in the next 10-20 years if no intervention is done [3]. These diseases have been strongly associated with unhealthy dietary habits, including inappropriate nutrition, caffeine overuse, skipping meals and snacking between meals [1,4]. Approximately 80% of heart diseases, stroke and type-2 diabetes and 40% of cancer could be avoided through a healthy diet, appropriate nutrition, regular physical activity, avoidance of tobacco use and alcohol consumption [1,2].

College life is an important stage for adolescents, as at this time their behaviours are conducive to change [5] but they are also exposed to stress and lack of time, posing a barrier to adoption of healthy practices [4] despite being equipped with knowledge [5]. Although behaviours of students are considered a temporary part of life, however, unhealthy habits learnt during this period generally persist in the adult life [6]. Medical students are assumed to have a greater knowledge about healthy lifestyle and dietary habits when compared with non-medical students. However, there is no evidence to indicate that this knowledge translates into practices in medical students; this is even more important as they are the future physicians, and the students who personally ignore adopting healthy lifestyle are not likely to influence their patients [5].

Universities and colleges are potentially important targets for the promotion of healthy lifestyles of the adult population [7]. Inappropriate diet and irregularities in diet are independent risk factors for obesity, which is multi-factorial in origin [8]. Obesity is a key risk factor in natural history of other chronic and non-communicable diseases [9]. Obesity is often expressed in terms of body mass index (BMI) and it is the most common measure used in population based studies for primarily categorizing nutritional status [10].

Thus this investigation was undertaken to study the dietary habits and its association with BMI among the undergraduate medical students of the PESIMSR, Kuppam.

The study objectives were 1) To identify the Dietary habits of undergraduate medical students. 2) To estimate the BMI of the study population 3) To find out the association between various dietary habits and BMI among the medical students.

## Material and Methods

This cross-sectional study was carried out in PESIMSR, Kuppam, Chittoor District, Andhra Pradesh, India, from January to December 2011. The study population comprised of undergraduate medical students from first to final year part II MBBS. The study was approved by the Institutional Ethics Committee of PESIMSR. All undergraduate medical students present in the college during this period were included in the study. Interns, repeaters and chronic absentees were not included.

A pilot study was conducted on a batch of 19 students. After explaining the purpose of the study and taking written informed consent, the students were given a self-administered questionnaire. All students of that batch participated in the study. Based on the practical experience of the pilot study, the proforma was redesigned.

### Method of Data Collection

A list of the undergraduate medical students from first to final year part II MBBS was obtained from their class attendance registers. The total number of students was found to be 679. Out of 679 students, 66 were not available during the time of data collection and after two attempts to trace, were excluded. The study was undertaken in the afternoons between 2 and 5 PM. The data were collected by dividing the study population into small batches of 15 students. The students were explained about the purpose of the study and the method of filling up the questionnaire. Informed consent was taken and then the data were collected using the pretested questionnaire. Students were given adequate time to fill up the questionnaire. The students were made to sit separately and any doubts while filling the questionnaire were addressed at the same time by the investigator.

After completing the questionnaire, the students' weight and height were measured by the investigator. Weight was measured using a standard spring balance bathroom weighing machine (Samso Manufacturers). Weight was taken without shoes and with minimum clothes on the body, nearest to 0.5 kg after correcting zero error. Height was measured in the standing position by using stadiometer (Samso Manufacturers) without footwear measuring to the nearest 0.1cm. BMI was calculated using Quetelet's Index [11]. Underweight, Overweight and obesity was classified using the WHO classification [9].

Brief information was given to the students on healthy dietary habits and the importance of adopting them to prevent chronic non-communicable

diseases in the end. The data were analysed using SPSS version 17. A *P*-value of <0.05 was considered to be statistically significant.

## Results

**Table 1: Socio-demographic profile of medical students**

Characteristics	Categories	No. of students ( <i>n</i> = 613)
Age group	17 - 19	207 (33.8%)
	20 - 22	338 (55.1%)
	23 - 25	64 (10.4%)
	26 - 28	4 (0.7%)
Gender	Males	317 (51.7%)
	Females	296 (48.3%)
MBBS academic year	I MBBS	144 (23.49%)
	II MBBS	242 (39.48%)
	Final year part I	141 (23%)
	Final year part II	86 (14.03%)
SES (Modified BG Prasad classification - AICPI 2011) [12]	Class I	347 (56.6%)
	Class II	161 (26.3%)
	Class III	68 (11.1%)
	Class IV	31 (5.1%)
	Class V	6 (1%)

\*SES - Socio economic status, AICPI - All India Consumer Price Index [13]

Table 1 shows the socio demographic profile of the students. Majority of the students (51.1%) were from town, while 30.7% of the students came from city and the rest from village background. Approximately 88% of the students belonged to nuclear families, while 12% belonged to joint families. Majority of the students belonged to Hindu religion. The students predominantly resided in hostel premises (98.7%) within the college campus and consumed food from the hostel mess.

### Dietary habit:

The mean calorie consumption in males was  $2171 \pm 278$  kcal and in females  $1892 \pm 264$  kcal. The mean protein consumption in males was  $52.58 \pm 7.6$  g and in females  $45.5 \pm 7.4$  g.

Majority of the students (83%) were taking mixed diet i.e. both vegetarian and non-vegetarian foods, while 10% of the students were taking vegetarian food along with eggs. Only 7% of the

students were pure vegetarians. Pure-vegetarian and vegetarian diet was consumed more by female students (8.8% and 10.8%, respectively), while mixed diet was consumed more by males (85.5%).

Table 2 depicts that only 58.9% and 43.7% of the students consumed diet adequate in calories and proteins, respectively. Male students consumed diet deficient in calories more than females (33.8% vs. 22.3%), whereas, female students' diet was more deficient in proteins than males (62.2% vs. 49.5%). When questioned about their food (menu) preferences, if given a choice, the students' preferences were as follows:

➤ Nearly 13% and 31% of the students preferred to have non-vegetarian foods for lunch and dinner, respectively.

➤ A total of 73% of the students had snacks once a day, while 18.9% of the students, twice daily and the rest (8.1%) did not have snacks regularly. When asked about their snacks, 68.5% liked to have milk and milk products and only 13.1% consumed fresh fruits and vegetables as snacks.

➤ This study reports that 9.1% of the students liked to have junk foods every day, with ice cream (18.8%), chats (16.8%) and chocolates (16.2%) quoted as favourite choices.

➤ Majority of the students' menu is influenced by themselves (62.5%), while 14.4% are influenced by their parents and 5.4% by their friends. In total, 6.2% responded that finance and time are the important driving influences while selecting foods. Only 1.5% of the students are influenced by their teachers or curriculum in selecting diet.

Approximately 56% students skipped meals, as shown in Table 3. Meal skipping pattern among males and females was almost equal (50.6% vs. 49.4%). In the first three academic years (65%, 54% and 62%, respectively), the meal skipping pattern was similar. However, final year part II students were regular in taking meals (36% skipped meals). There was a statistically significant association between skipping meals and MBBS years.

Of the students who skipped meals, 74.6% of the students skipped breakfast, while 14.3% skipped lunch and the rest dinner. Majority of the students (46.1%) quoted 'disliking food' as the most common reason for skipping meals, followed by 'no time' by 32.9% of the students. In all, 14% of the students missed meals voluntarily because they were conscious of their body image and 4% of the students missed meals only during exams. A total of 3% of the students give 'non-availability of foods' as the reason for missing meals.

**Table 2: Distribution of gender-wise calorie and protein consumption (24 hour recall method)**

RDA (%)	Calories			Proteins		
	Males	Females	Total	Males	Females	Total
< 90	107(33.8%)	66(22.3%)	173(28.2%)	157(49.5%)	184(62.2%)	341(55.6%)
90 - 110	182(57.4%)	179(60.5%)	361(58.9%)	160(50.5%)	108(36.5%)	268(43.7%)
>110	28(8.8%)	51(17.2%)	79(12.9%)	0(0%)	4(1.3%)	4(0.7%)
<b>TOTAL</b>	<b>317</b>	<b>296</b>	<b>613</b>	<b>317</b>	<b>296</b>	<b>613</b>

\*RDA – Recommended Dietary Allowance

**Table 3: Distribution of meal skipping pattern according to academic year and gender**

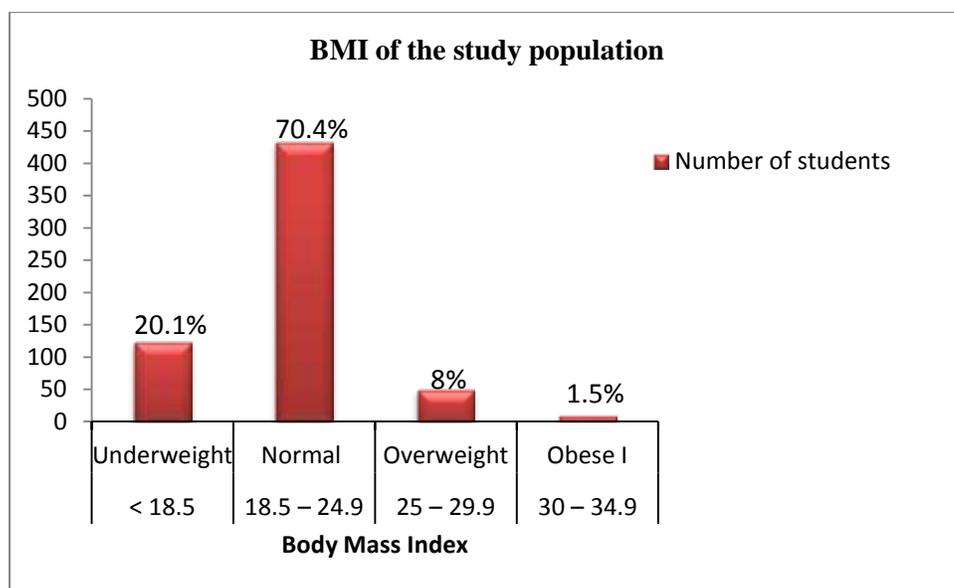
MBBS year	Meal skipping pattern						Grand total
	Yes			No			
	Male	Female	Total	Male	Female	Total	
I year	51	43	94 (65.3%)	18	32	50 (34.7%)	144
II year	56	74	130 (53.7%)	68	44	112 (46.3%)	242
Final year part I	46	41	87 (61.7%)	33	21	54 (38.3%)	141
Final year part II	20	11	31 (36.0%)	25	30	55 (64.0%)	86
<b>Total</b>	<b>173 (50.6%)</b>	<b>169 (49.4%)</b>	<b>342 (55.8%)</b>	<b>144 (53.1%)</b>	<b>127 (46.9%)</b>	<b>271 (44.2%)</b>	<b>613 (100%)</b>

\* $X^2 = 21.266$ ,  $df = 3$ ,  $P < 0.0001$ **Table 4: Distribution of medical students according to MBBS academic year and knowledge on important meal**

MBBS year	Important meal			Total
	Breakfast	Lunch	Dinner	
I Year	60 (41.7%)	50 (34.7%)	34 (23.6%)	144
II Year	112 (46.3%)	95 (39.3%)	35 (14.5%)	242
III Year	73 (51.8%)	52 (36.9%)	16 (11.3%)	141
IV Year	49 (57.0%)	33 (38.4%)	4 (4.7%)	86
<b>Total</b>	<b>294 (48.0%)</b>	<b>230 (37.5%)</b>	<b>89 (14.5%)</b>	<b>613</b>

\* $X^2 = 18.688$ ,  $df = 6$ ,  $P < 0.005$ 

When questioned about the most important meal of the day, majority of the correct responses were from the final year students (57%) and least from the first year students (41.7%) which was statistically significant as shown in Table 4.

**Figure 1: Distribution of study population according to BMI (n=613)**

Note: There were no students in the obese II and obese III category.

Majority of the students were having normal BMI (432 students). The overall prevalence of overweight and obesity was 8 % (49 students) and 1.5 % (9 students) respectively.

**Table 5: Distribution of basic characteristics of study subjects in relation to BMI (n=613)**

Basic characteristics	Categories	BMI < 18.5	BMI 18.5 – 24.9	BMI > 25	Total
Age (years) ( $X^2 = 25.99$ , $df = 6$ , $P < 0.0001$ Fischer's exact test with Yates' correction)	17 – 19	62 (30%)	128 (61.8%)	17 (8.2%)	207
	20 – 22	58 (17.2%)	246 (72.8%)	34 (10.1%)	338
	23 – 25	3 (4.7%)	55 (85.9%)	6 (9.4%)	64
	26 – 28	0 (0%)	3 (75%)	1 (25%)	4
Gender ( $X^2 = 5.6$ , $df = 2$ , $P = 0.06$ )	Males	52 (16.4%)	235 (74.1%)	30 (9.5%)	317
	Females	71 (24%)	197 (66.6%)	28 (9.5%)	296
Academic year ( $X^2 = 17.68$ , $df = 6$ , $P < 0.008$ )	I year	40 (27.8%)	89 (61.8%)	15 (10.4%)	144
	II year	51 (21.1%)	172 (71.1%)	19 (7.9%)	242
	Final part I	20 (14.2%)	101 (71.6%)	20 (14.2%)	141
	Final part II	12 (14%)	70 (81.4%)	4 (4.7%)	86
Socio economic status ( $X^2 = 9.08$ , $df = 8$ , $P = 0.3$ Fischers' exact test with Yates' correction)	Class I	66 (19%)	242 (69.7%)	39 (11.2%)	347
	Class II	35 (21.7%)	117 (72.7%)	9 (5.6%)	161
	Class III	15 (22.1%)	47 (69.1%)	6 (8.8%)	68
	Class IV	4 (12.9%)	23 (74.2%)	4 (12.9%)	31
	Class V	3 (50%)	3 (50%)	0 (0%)	6

Table 5 shows among the socio demographic variables, BMI was significantly associated with age and MBBS academic years.

**Table 6: Relationship between calorie consumption and skipping meals with BMI (n=613)**

Calories	BMI < 18.5	BMI 18.5 – 24.9	BMI > 25	Total	P value
Deficient	108 (62.4%)	64 (37%)	1 (0.6%)	173	$\chi^2 = 46.7, df = 4, P < 0.0001$ (Yates' correction applied)
Normal	15 (4.2%)	333 (92.2%)	13 (3.6%)	361	
Excess	0 (0%)	35 (44.3%)	44 (55.7%)	79	
<b>Skipping meals</b>					
Yes	58 (17.0%)	246 (71.9%)	38 (11.1%)	342	$\chi^2 = 6.17, df = 2, P = 0.046$
No	65 (24.0%)	186 (68.6%)	20 (7.4%)	271	

Table 6 shows that majority of the underweight students (62.4%) consumed foods deficient in calories while overweight students consumed foods excess in calories (55.7%) irrespective of gender. With respect to skipping meals, 11.1% and of the overweight students and 17 % of the underweight skipped meals. Females skipped meals more when compared to males in the underweight (18.3% v/s 15.6%) as well as in the overweight categories (14.2% v/s 19.2%). There was a statistically significant association between calorie intake and skipping meals with BMI.

## Discussion

This study assessed the dietary habits of medical students who represent a significant community of future health practitioners. We observed that most of the students did not meet the recommended dietary allowance of calories and proteins. This was observed in many studies conducted in university settings, wherein most college students have poor nutritional habits [14-18]. Sajwani et al. report that in their comparative study between medical and non-medical students, non-medical students' diet practices were better than medical students [5]. We found that majority of the students (73%) snacked once a day, which is in contrary to other studies, which report higher frequency of snacking [5-7,19]. In a study conducted by Nisaret al. [20] among medical students, 96.4% of the students consumed junk foods daily in contrast to our study, wherein only 9% of the students consumed junk foods daily. Junk food consumption was associated with being four times overweight as compared with those who did not consume junk food (OR=4.47, 95% CI= 0.93-29.5) [20].

As far as the meal skipping patterns are considered, many studies reported that more than half of the medical students skipped their meals atleast once a day and breakfast was the common

missed meal [5,6,10,20] similar to this study. University non-medical students take meals regularly three times daily, with less frequency of meal skipping [5,7,21]. In contrary to our study which reported disliking foods, 'lack of time' was identified as the most important reason for skipping meals in many studies [5,6]. Skipping breakfast has been associated with lower nutritional status and an increased risk of developing cardiovascular diseases and obesity in the future [22,23]. Many studies have reported that, in terms of eating habits, medical students usually do not follow healthy eating habits [5,8,10,20]. The typical medical student diet is high in fat and low in fruits and vegetables. Students often select fast food due to its palatability, availability and convenience [24]. These findings are cause for concern because there is ample data suggesting that fruit and vegetable consumption may be protective against most cancers and cardiovascular disease due to various antioxidants, folate, fibre, potassium, flavonoids and numerous other phytochemicals present in them [25,26].

Many studies report a similar mean BMI as in this study ( $20.6 \pm 2.2, 22.3 \pm 3.6$ ) [5,7] among medical students. Many studies revealed similar proportion of underweight students, predominantly among females as in this study [5,7,10,27]. The proportion of overweight, ranged from 2.5 % to 41.7 % in various studies [5,7,8,10,21]. Our prevalence of 1.5 % obesity was similar to other Indian studies conducted on medical students by Gupta [8] (3.4 %) and Chhabra [28] (2 %). In a study conducted among medical students in Mangalore, it was found that overweight students skipped meals more in an attempt to reduce body weight in contrast to this study [10]. Age, MBBS years, intake of calories and meal skipping patterns were significantly associated with BMI in this study. Various studies have shown frequent snacking [8], junk food consumption [20], stress, eating more and snacking between meals [29] to be significantly associated with BMI. This could be due to differences in the geographic location,

socio demographic factors, compact class schedule, stay in hostel, and limited access to junk foods, television, computer and less time to snack between meals among our study population.

### Conclusion:

We observed that majority of the students did not meet the recommended dietary allowance of calories and proteins. Skipping meals, particularly breakfast and junk food consumption was common. The prevalence of overweight was 8 % and obesity, 1.5%. Statistically significant association was found between BMI and age, MBBS years, intake of calories and meal skipping. Their dietary habits in general were poor. Dietary habits have a great influence on morbidity and mortality in life and due to the cumulative effect of adverse factors throughout life of an individual, it is particularly important to adopt a healthy dietary practice. This study highlights the fact that superior knowledge about healthy dietary habits does not necessarily result into better practices.

### Recommendations:

Improvement in dietary habits, if made in early years of medical schooling, would produce physicians practicing and promoting healthy dietary habits.

- Nutrition education is required including counselling on skipping meals and consumption of snacks.
- Gender specific interventions are essential.
- A need for improvement is required in health seeking behaviour.
- Programmes focusing on improving time management skills of students are essential.
- They need to be encouraged to participate in physical exercise, especially sports, athletics and other outdoor activities.

Further studies should be undertaken to identify specific barriers among medical students in practicing healthy dietary habits and come up with workable solutions.

### Limitations:

House surgeons were not included in this study due to logistic problems. Recall and non-response bias could have occurred from the students while filling the questionnaire, which warrants further research.

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