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Nutritional Assessment by Selected Anthropometric Variables among Second Year Students of a Private Medical College, Kolkata – a Cross-sectional Study

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Abstract

Introduction: Poor nutritional status can be defined by the states of under-nutrition or over-nutrition. Malnutrition, in every form, presents significant threats to human health. Today the world faces a double burden of malnutrition that includes both undernutrition and overweight, especially in low- and middle-income countries. The prevalence of malnutrition especially overnutrition is increasing day by day. The prevalence of obesity has increased worldwide in the past ~50 years, reaching pandemic levels. Medical students generally live a sedentary life and are under lots of academic stress.

Objective: This study was designed to determine nutritional status by selected anthropometric variables among second-year students of a private Medical College, in Kolkata.

Materials and methods: This is an Institution based Observational Study Cross-Sectional in design. The study setting was a private medical college in Kolkata, West Bengal. The study population was 2nd year Undergraduate MBBS students and the duration of study was 3 months from Sep 24 to Nov 24. The second year MBBS batch was selected purposively and the participants were selected by census methods. Anthropometric measurement was done maintaining standard protocol as per WHO STEPS guidelines.

Results: 34 % of the study participants were overweight and 9 % were obese. More than one-third of the male study participants have increased waist circumference and more than the normal waist-hip ratio. Among the females about two third were having truncal obesity The prevalence of Normal Weight Obesity was 22.6 % among males and 57.7% among females. 17.4 % of the study participants have a substantial risk of developing Non-Communicable Diseases and have a high waist-height ratio.

Conclusion: The prevalence of overweight and obesity was higher as compared to NFHS 5 data. Females were more prone to develop truncal obesity. More than half of the study participants had a higher risk of developing Non-Communicable Diseases. Proper intervention is required at various levels to minimize the burden of the disease.

INTRODUCTION

Nutritional status is an evaluation of individual health. It is determined from information obtained by physical, biochemical, and dietary studies.[1] Poor nutritional status encompasses both the aspects of under-nutrition and over-nutrition. Malnutrition presents significant threats to human health. In low- and middle-income countries there are problems of double burden of malnutrition that includes both undernutrition and overweight. There are multiple forms of malnutrition, including undernutrition (wasting or stunting), inadequate vitamins or minerals, overweight, obesity, and resulting diet-related noncommunicable diseases.[2]

About one-third of the global burden of undernutrition is from India. Considering India's huge population, actions to reduce all forms of malnutrition are important to attain global targets. In 2017 India launched the National Nutritional Strategy to provide a platform for stakeholders to -

Keywords: Nutritional status, obesity, overnutrition, overweight, Waist-Hip Ratio

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-drive the agenda of "Mission Malnutrition Free India-2022".[3] Nutrition is one of the important agendas of the Sustainable Development Goals (SDGs) of 2030. Among the 17 SDGs, at least 12 goals include indicators relevant to nutrition.

Overweight is a condition of excessive fat deposits. Obesity is multifactorial in causation and is characterized by excessive fat deposits that can impair health. Obesity is an important risk factor for the development of type 2 diabetes and heart disease, it can affect bone health and reproduction, it also increases the risk of certain cancers. Obesity influences the quality of living, such as sleeping or moving.[4]

As per the WHO report in 2022, 2.5 billion adults aged 18 years and older were overweight, including over 890 million adults who were living with obesity. This corresponds to 43% of adults aged 18 years and over who were overweight; an increase from 1990, when 25% of adults aged 18 years and over were overweight.[5] Prevalence of overweight varied by region, from 31% in the WHO South-East Asia Region and the African Region to 67% in the Region of the Americas. In 2022, about 16% of adults aged 18 years and older worldwide were obese. Between 1990 and 2022 the prevalence of obesity has increased more than two times all over the world.[5] In India, among adult women obesity increased from 1.2% in 1990 to 9.8% in 2022, and among men obesity increased from 0.5% to 5.4 % in the same period.[6] In India 13.7% of women and 12.5% of men are underweight. Hence, India has become one of the countries with a high "double burden of malnutrition".

The diseases associated with overweight and obesity are predictable and preventable. With a view to making fitness an integral part of our daily lives, the Honourable Prime Minister of India launched the Fit India Movement on 29th August 2019. The mission of the Movement is to bring about behavioural changes and move towards a more physically active lifestyle.[8] Medical students generally live a sedentary life and under lots of academic stress and the prevalence of overweight and obesity is higher among them. There has been a dearth of literature regarding the burden of nutritional problems among college and university students. The objective of this study is to estimate and compare the nutritional status among male and female study participants by selected anthropometric variables.

MATERIALS AND METHODS

Study type and design: This is an institution-based Observational Study Cross Sectional in design.

Study Setting: A private medical college in Kolkata, West Bengal.

Study Period: The duration of the study was 3 months from Sep 24 to Nov 24.

Study Population: 2nd-year Undergraduate MBBS students. Those who have given written informed consent were considered for this study and those who were critically ill were excluded from the study.

Sample size and sampling technique: The second-year MBBS batch was selected purposively and the participants were selected by total enumeration. Out of a total of 200 students, 143 of them had given consent for this study.

Study tools and technique: The study tool was pre-designed, pretested, structured questionnaire consisting of two parts. The first part consists of sociodemographic and health-related variables. The second part consists of anthropometric measurements. The anthropometric measurement includes height, weight, waist circumference, and hip circumference. From the anthropometric variables other derived variables like BMI, Waist Hip Ratio, and Waist Height Ratio were calculated. The study technique was a google form questionnaire circulated by electronic media. Anthropometric measurement was done maintaining standard protocol as per WHO STEPS guidelines.[9] Anthropometric measurement of female participants was taken only by female researchers.

Study variables: Sociodemographic and personal characteristics: Age group (in completed years), Sex, Religion, Permanent Residence, Present residence, Type of family, Monthly per capita income (in Indian Rupees), Frequency of consumption of fast/junk food (no of days/week), Average no of servings of vegetables consumed per day, Average hours of exercise per week, Tobacco use, Alcohol consumption, Narcotics consumption, Average duration of sleep per day in hours and Average screentime per day in hours. Chronic illness are the independent variables whereas nutritional status was the outcome variable.

Operational definition: In our study, overweight[10] is defined as BMI $\geq$ 25 kg/m^2 and < 29.9 kg/m^2, and obesity[10] with BMI $\geq$ 30 kg/m^2. Study participants with adequate body mass index (18.5–24.9 kg/m^2) but having truncal obesity will be considered as Normal-weight obesity syndrome[11]. Waist circumference ≥80cm and waist-hip ratio ≥ 0.85 in females indicate abdominal obesity. Corresponding values for males for consideration of abdominal obesity are waist circumference ≥95cm and waist-hip ratio ≥ 0.90. Waist Height ratio > 0.60 has also been considered in this study as a parameter for the assessment of central adiposity and increased health risk.[13]

Data Analysis: Data were recorded in Microsoft Excel and after coding transferred to SPSS, IBM, Chicago Version 17. Categorical data were analyzed by number and frequency. Continuous data were described by central tendency and variance. Normality was checked by the Shapiro Wilk test. Comparison between the BMI of male and female participants was done by student t test and the association was checked by chi-square test. p value less than 0.05 was considered to be statistically significant.

RESULT

In **Table I** that the maximum number of study participants belong to the age group 19-21 years with a mean age of 21.04 years (±1.81). The majority of the participants were female (59 %), Hindu (80.4 %) and belong to nuclear family (78.3%). Among the study participants majority of them were from urban backgrounds (90%) and presently reside in hostel (62.9%). The median monthly per capita income was Rs 25000(12500, 50000). The mean duration of daily sleep was 6.43 hours(±1.43) and the mean daily screen time use was 5.61 hours (±3.58). Comorbidity was present in 32.9 % of study participants and the majority of them were not involved in any substance use . About one third of the study participants consumed junk food more than

three days a week and majority consumed less than three servings of fruits and vegetables per day.

Fig 1 and Table II show the Box and Whisker Plot comparing the BMI among the male and female participants. In both cases, there are few out layers. The mean BMI of male and female participants was 25.05 kg/m2 (±4.09) and 26.67 kg/m2 (± 4.26). The student t-test was done to compare the BMI between the male and the female participants. The value of p was 0.59 which shows that there were no statistical differences of BMI in between the two groups.

Table III shows the distribution of study participants according to nutritional status. Nutritional status was assessed as per the WHO BMI scale of SE Asia.[14] Among the study participants 34% were overweight and 9% were obese. Among the 13 participants who were obese 10 of them were moderately obese and three were severely obese. Among the male participants 36% were overweight and among the female 32% were overweight.

Table IV shows the distribution of study participants according to selective anthropometric parameters. Here in the case of a male waist circumference of more than 95 cm and a waist-hip ratio of more than 0.90 is considered to be a higher risk of developing noncommunicable disease and in the case of a female waist circumference of more than 80 cm and waist-hip ratio of more than 0.85 is considered to be higher risk of developing NCD.[12] We can see 42.4 % of males and 63.9 % of females had higher waist circumference. 37.3 % of males and 64.3 % of females had an increased waist-hip ratio and were at higher risk of developing NCD. **Table V** shows the distribution of study participant according to their Waist-height ratio. In the table, we can see that about 46.2% of the study participants have an increased risk of developing NCD as their having a Waist Height ratio[15] between 0.5 to 0.6 and 17.4% of study participants had a substantial risk of developing NCD those who have Waist Height ratio more than 0.6.

Table VI shows the prevalence of normal weight obesity[11], that is the prevalence of truncal obesity among those who have normal BMI. 73 of the study participants have normal BMI among which 41.1% have truncal obesity. Truncal obesity is present in 57.7% of female study participants and 22.6% of male study participants. $\chi 2=7$ 63 (df-1) and $p = 0.03$ the female had OR 4.15(1.47-11.72) of developing Normal weight obesity compared to male participants.

DISCUSSION

In our study 34 % of the study participants were overweight and 9 % were obese. Among the male participants, 43 % were overweight and obese. As per NFHS 5, the proportion of overweight and obesity among males is 29.8 % in urban areas which has increased from 22.9 in NFHS 4.[16] Again in our study among female participants the proportion of overweight and obesity was 43 % compared to NFHS 5 result of 33 %. As suggested from NFHS data the prevalence of overweight and obesity is rising. In this study, we are getting higher prevalence probably due to the younger age group and sedentary lifestyle of study participants.

Compared to the NFHS 5 report where 59.9 % of women and 50.1 % of men have increased waist-hip ratio in urban areas in our study 64.3% of female participants and 37.3 % of male study participants had increased waist-hip ratio. This finding can be explained by their sedentary habit. The mean daily screen time of our study participants was 5.61 hours (±3.58) and according to a 2023 digital report, the average screen time for people ages 16 to 64 globally is 6 hours 37 minutes per day[17]. This increase in screen time is due to academic activities in the post-COVID period, on average Indians used 37.59 % of daily awake hours for screen time compared to Japan where they used 21.70 % of daily awake hours.[18]

In a study by Bede F et al in Cameroon in 2019 high prevalence of malnutrition of 29.4% based on BMI (underweight 4.9%, overweight 21.6%, and obesity 3.0%) among second-year medical students[1] whereas in our study the prevalence of malnutrition is 49 % (34% overweight and 9 % obesity) which is due to different sociodemographic parameter. In a study by Aryal V et al in Nepal in 2022 among 180 medical students, 57 (31.67%) (24.87-38.47, 95% CI) were obese according to relative fat mass cutoff. Among them, 13 (22.81%) males and 44 (77.19%) females were obese according to RFM (relative fat mass) cut-off.[19] The result is similar to our study only the females are disproportionately more obese. The only explanation they have calculated relative fat mass. In our study, females had OR 4.15(1.47-11.72) of developing truncal obesity than males despite having normal BMI.

In a study by Venkatrao M et all in 2021 Prevalence of obesity in India is 40.3%. Zonal variations were seen as follows: south highest at 46.51% and east lowest at 32.96%. Obesity was higher among women than men (41.88% vs. 38.67%), urban than rural (44.17% vs. 36.08%), and over 40 than under 40 (45.81% vs. 34.58%). More education implied higher obesity (44.6% college vs. 38% uneducated), as did lower physical activity (43.71% inactive vs. 32.56% vigorously active).[6] In our study the prevalence of overweight and obesity was 34 % and 9 % respectively.

In a study by Yogesh M et al among government doctors in Gujrat[20] the prevalence of overall obesity was 101 (20%), NWO 239 (48.7%), and Normal weight central obesity (NWCO) 210 (42.8%). The prevalence of NWCO in our study is 41.1 %.

LIMITATIONS

In our study, the strength was for the measurement of the Anthropometric Variables, we have the following standard WHO STEPS GUIDELINE. This study was conducted in a small population in a single Medical College. So, the result of the study cannot be generalized to the entire population. We have taken selected anthropometric variables. We have rejected some variables like Skin-fold Thickness due to Operational Problems.

CONCLUSION

The prevalence of overweight and obesity among medical students was found higher than in the general population. It is recommended that the participants adopt a balanced diet and avoid HSSS (high salt, sugar, and saturated fat) food, and engage in regular physical activities. Implementation of nutrition guidelines for meals provided in schools, colleges, workplaces, and healthcare facilities.

Sell of commercial packaged food items at institutional canteen to be avoided. Institutions must participate in the Fit India Movement and celebrate International Yoga Day to increase awareness for physical activities. School-based programs and Workplace Wellness initiatives toward a healthy weight and ultimately toward healthy life should be encouraged.

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make meaningful progress in this critical area of public health.

CONFLICT OF INTEREST

Not Declared

FUNDING

Not declared

Fig 1 : Box & Whisker plot Comparing the BMI among the male(n-59) and female (n-84)

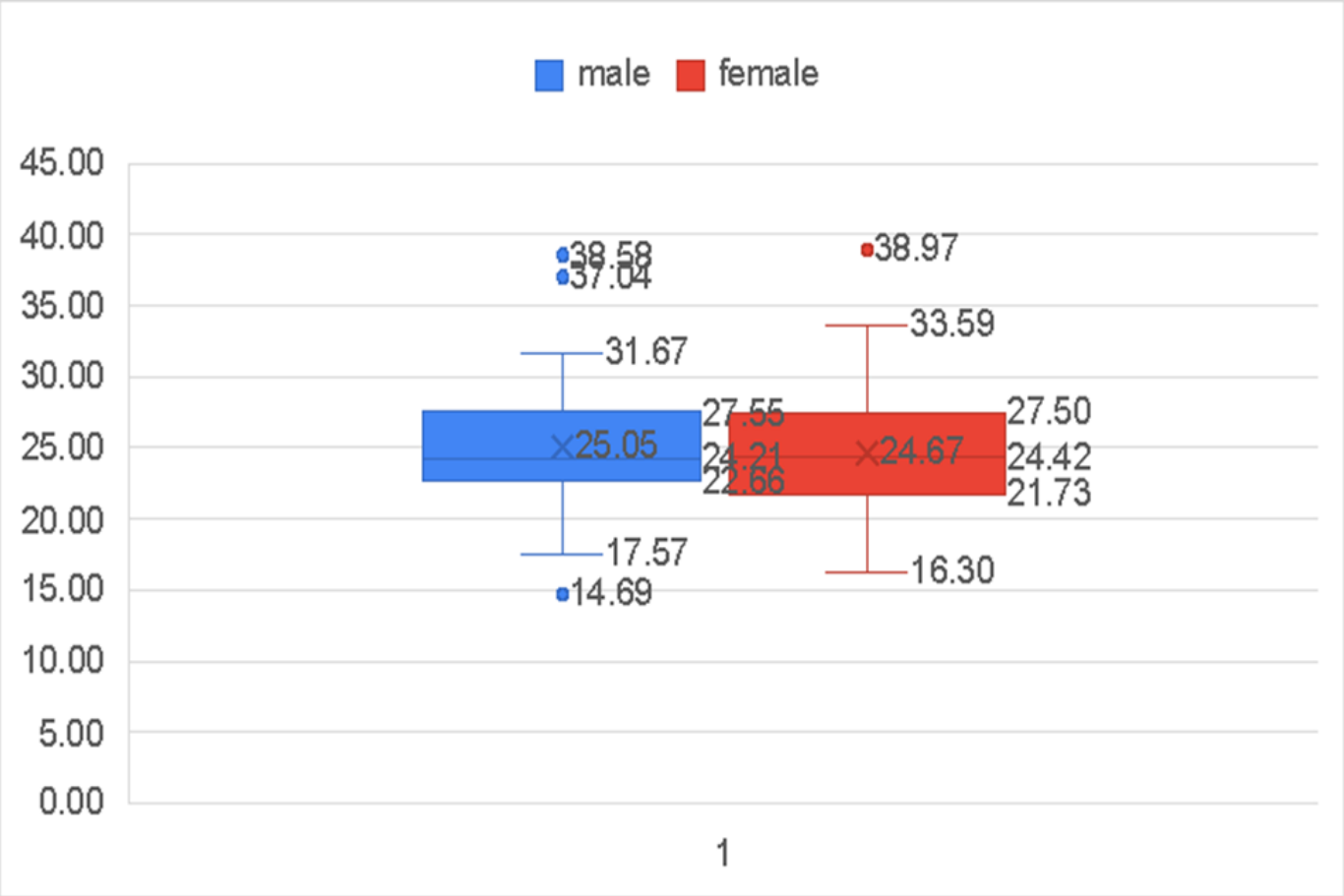

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Table 1: Distribution of study participants according to sociodemographic and health-related parameter (n-143)

Variable	Subgroup	Number (%)
Age group (in completed years)	<19	6 (4.19%)
	19-21	96 (67.13%)
	>21	41 (28.67%)
Sex	Male	59 (41%)
	female	84 (59%)
Religion	Hindu	115 (80.4%)
	Muslim	24 (16.8%)
	Others	4 (2.8%)
Permanent Residence	Rural	15 (10%)
	Urban	128 (90%)
Present residence	Day scholar	53 (37.06%)
	Living inside campus	90 (62.93%)
Type of family	Nuclear	112 (78.32%)
	Joint	31 (21.68%)
Monthly per capita income(in Indian Rupees)	<20000	62 (43.35%)
	20000-40000	42 (29.37%)
	>40000	39 (27.27%)
Frequency of consumption of fast/junk food (no of days/week)	Never or rarely	12 (8.39%)
	<3	79 (55.24%)
	3-5	45 (31.46%)
	Most of the days	7 (4.89%)
Average no of servings of vegetables consumed per day	<1	15 (10.5%)
	1-3	96 (67.1%)
	>3	32 (22.4%)
Average hours of exercise per week	<3	56 (39.16)
	3-7	68 (47.55%)
	>7	19 (13.28%)
Tobacco use	Never	127 (88.8%)
	Currently using	10 (7%)
	Used in past	6 (4.2%)
Alcohol consumption	Never	122 (85.3%)
	Currently using	9 (6.3%)
	Used in past	12 (8.4%)
Narcotics consumption	Never	139 (97.2%)
	Currently using	1 (0.7%)
	Used in past	3 (2.1%)
Average duration of sleep per day in hours	<5	8 (5.6%)
	5-7	105 (73.4%)
	>7	30 (21%)
Average screentime per day in hours	<3	26 (18.18)
	3-5	73 (51.82)
	>5	44 (30)
Chronic illness	Yes	47 (32.9)
	No	96 (67.1)

Table 2: Description of BMI among the study participants (n-143)

BMI (kg/m^2)	Total (n-143)	Male (n-59)	Female (n-84)	Statistics
Maximum	38.97	38.58	38.97	**Student t-test done** $p = 0.59$
Minimum	14.69	14.69	16.29	
Range	24.28	23.89	22.68	
Mean (± SD)	24.83(4.18)	25.05 (±4.09)	26.67 (±4.26)	

Comment: *There are no significant statistical differences of BMI between the male and female*

Table 3: Distribution of study participants according to nutritional status (n -143)

Nutritional status	Underweight *Number (%)*	Normal *Number (%)*	Overweight *Number (%)*	Obese *Number (%)*	Total *Number (%)*
Male	3(5)	31(52)	21(36)	4(7) *(2 mod & 2 severe obese)*	59(100)
Female	6(7)	42(50)	27(32)	9(11) *(8 mod & 1 severe obese)*	84(100)
Total	**9(6)**	**73(51)**	**48(34)**	**13 (9) (10 moderate & 3 severely obese)**	**143(100)**

Comment*: There are no significant statistical differences of BMI between the male and female*

Table 4: Distribution of study participants according to selected anthropometrical parameters (n-143)

Anthropometrical parameter	Sex	Total Number (%)	Number (%) with higher risk of NCD	Number (%) with less risk of NCD	Descriptive Statistics
Waist circumference	**Male**	59(100)	25(42.4)	34(57.6)	Mean-91.25(±12.07)cm Max-117cm Min-68cm
	Female	84(100)	53(63.9)	31(36.1)	Mean- 86.01(±1.48)cm Min-52cm Max-110cm
Waist Hip Ratio	**Male**	59(100)	22(37.3)	37(62.7)	Mean-0.91(±0.06) Max-1 Min-0.69
	Female	84(100)	54(64.3)	30(35.7)	Mean-0.86(±0.07) Max-1.01 Min-0.65

In the case of male waist circumference ≥95cm and waist-hip ratio ≥ 0.90 are considered to be a higher risk. In case of female waist circumference ≥80cm and waist hip ratio ≥ 0.85 are considered to be higher risk

Table 5: Distribution of study participants according to waist height ratio (n -143)

Waist to Height Ratio	Number (%)
<0.50	52(36.4)
0.50-0.60 (increased risk)	66(46.2)
>0.60 (substantial risk)	25(17.4)
Total	**143(100)**

Table 6: Prevalence of truncal obesity among participants having normal BMI (n-73)

Sex (number)	Presence of truncal obesity *Number (%)*	Absence of truncal obesity *Number (%)*	Inferential statistics
Female(42)	23(57.7)	19(42.3)	**OR 4.15(1.47-11.72)** X^2 **= 7.63(df-1)** **p = 0.003**
Male (31)	7(22.6)	24(77.4)	
Total (73)	**30(41.1)**	**43(58.9)**	

Note: *Truncal obesity (NWO) is defined as waist-hip ratio ≥ 0.90 in males and ≥0.85 in females with normal BMI*

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