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Research Article

PREVALENCE OF OBESITY AND OVERWEIGHT AMONG SELECTED YOUNG ADULTS (19-24YEARS)

Ithayamalar.S[1]* and Kowsalya.S[2]

[1]Department of Nutrition and Dietetics, Seethalakshmi Ramaswami College, Trichy
[2]Department of Food Science and Nutrition, Avinashilingam University, Coimbatore

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ABSTRACT

World Health Organization (WHO) states that obesity is one of the most common, yet among the most neglected, public health problems in both developed and developing countries. The aim of the study was to assess the prevalence of obesity and overweight among young adults in the age group of 19-24 years. The study was registered in the Clinical Trial Registry of India and Ethical clearance was obtained from the Institutional Human Ethical Committee. Oral as well as written consent was obtained from all the subjects. Inclusion and exclusion criteria were considered for the selection of sample. A total of 1873 subjects comprising of 990 male and 883 female subjects were enrolled for the purpose of screening obese and overweight. Result of the present study revealed that the prevalence of obesity was 19.91 and 23.21 per cent among the male and female subjects respectively.

INTRODUCTION

Obesity is described as a global pandemic and is the most widespread metabolic disorder in several countries. (Marie *et al*., 2014, Constantine *et al*, 2008). According to WHO, overweight and obesity are defined as an abnormal or excessive fat (adipose tissue)accumulation which occurs as a result of an energy imbalance either due to increased energy intake or decreased energy output or a combination of both (WHO, 2015). Obesity is a consequence of complex interactions between genetic, social, environmental and behavioral factors. (Constantine *et al.*, 2008, Seagel *et al.*, 2009). It predisposes to complicating conditions like cardiovascular diseases, type 2 diabetes mellitus, certain cancers, asthma, sleep apnoea and osteoarthritis.

Young adult is the period of transition from late adolescent to adulthood. This is the critical phase of life, where major physical, physiological, psychological, and behavioural changes with changing patterns of social interactions and relationships exist. In countries like India, the rise in obesity prevalence could be attributed to the increasing urbanization, use of mechanized transport, increasing availability of processed and fast foods, increased television viewing, adoption of less physically active lifestyles and consumption of more "energy-dense, nutrient-poor" diets particularly among young adults(WHO,2003, Bell *et al.,*2002 and Misra *et al*., 2010).

Industrialization and urbanization also contribute to increased prevalence of obesity. Studies from different parts of India have provided evidence of the rising prevalence of obesity (Mohan and Deepa, 2006; Bhardwaj, *et al*., 2011, Deepa, *et al.,* 2009 and Misra and Khurana, 2008). Asian Indians have a greater predisposition to abdominal obesity and accumulation of visceral fat and this has been termed as "Asian Indian phenotype (Joshi, 2003 and Deepa, *et al.,* 2006). NFHS - 4 (2016) indicates that 30.6 and 36.2 per cent of urban male and females are overweight or obese while in the rural it was reported as 30.6 and 25.6 per cent in male and female population respectively in Tamil Nadu.

BMI is an acceptable approximation of total body fat at the population level and can be used to estimate the relative risk of disease in most people. BMI is a simple index of weight/for/ height that is commonly used to classify, overweight and obesity in adult. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). WHO classifies BMI over 25 as overweight and BMI over 30 as obese for Asian population; additional trigger points for public health action were identified as $23kg/m^2$ or higher, representing increased risk and $25.5kg/m^2$ or higher as high risk. Among

Corresponding author:* **Ithayamalar.S
Department of Nutrition and Dietetics, Seethalakshmi Ramaswami College, Trichy

Asians and Indians morbidity and mortality occur at a lower BMI, and it is proposed that the BMI cut-offs for overweight and obesity in these populations be lowered to >23 and >25 respectively (WHO, 2000).

MATERIALS AND METHODS

Ethical Clearance and Trial Registration

The study was presented before the Institutional Human Ethical Committee of the Avinashilingam University and ethical approval was obtained (AUW/IHEC13/FHP-02). The trial was also registered in Clinical Trial Registry of India (CTRI) of ICMR and trial registration number (CTRI/2014/11/005222) was obtained before the conduct of the study

Selection of the Area and Subjects

The urban area of Coimbatore district of Tamil Nadu was selected. Young adults in the age group of 19 – 24 years were recruited. Young adults were selected in order to inculcate lifestyle and food modification at the earliest time possible in their life. Creating awareness on obesity and overweight might also pave way for prevention strategies. Both male and female subjects were included in the study. The authorities of various colleges in Coimbatore were approached for their consent to recruit subjects and conduct the study. The duration, nature and aim of the study were explained to them before obtaining consent. A total of 1873participants from different colleges were randomly selected for screening based on their willingness to participate in the study

Screening of the Subjects for Obesity and Overweight

The subjects were screened for obesity, overweight and normal category using the BMI latest Asian cut-off (WHO, 2000). Based on the BMI, the subjects were divided into three groups viz., obese, overweight and normal. Purposive sampling technique was used for this selection. The inclusion and exclusion criteria were strictly followed for the recruitment of subjects.

The inclusion criteria

- Subjects willing to participate and sign consent.
- Subjects between 18- 24 years of age
- Subjects with BMI above 23
- Subjects with sound mental health

The exclusion criteria

- Subjects not willing to give a written consent.
- Subjects below 18 and above 23 years of age.
- Subjects enrolled in weight loss programmes.
- Subjects enrolled in other clinical trials
- Subjects with complication of DM or CVD

The subjects in each category were carefully scrutinized for participation in the study with the above inclusion and exclusion criteria.

Measurement of height and weight

Height and weight were measured initially and BMI was calculated. The height of the subjects were measured in standing position with bare foot as measured to the nearest of 0.1 cm. Body weight was measured using digital weighing balance to the nearest of 0.1 kg. The subjects were asked to empty bladder before weight measurement and they were asked to wear light clothing during measurement. All the measurements were taken twice to ensure accuracy

Calculation of Body Mass Index (BMI)

Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2).BMI was calculated using the formula.

BMI = Weight (kg) / Height (m^2)

Table 1 Body Mass Index Cut-Off (Asians)

Criteria	Body Mass Index Cut off for Asians
Obese	< 25
Overweight	23 – 24.9
Normal	18.6 -22.9
Under weight	<18.5

Source: WHO, IASO, IOTF (2000)

RESULTS AND DISCUSSION

Age wise distribution of subjects based on age and gender

The subjects were categorized based on age as well as gender and presented in table 2. A total of 1873 subjects comprising of 990 male and 883 female subjects were enrolled for the purpose of screening obese and overweight subjects among young adults in the age group of 19-24 years.

Table 2 Age wise distribution of the subjects

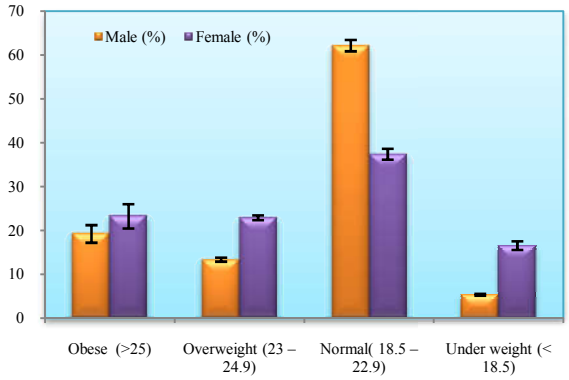
N = 1873

Age (years)	Male(990)		Female(883)	
	No	%	No	%
19	185	18.69	160	18.12
20	159	16.06	140	15.86
21	177	17.88	186	21.06
22	205	20.71	186	21.06
23	118	11.92	102	11.55
24	146	14.74	109	12.35
Total	990	100	883	100

The subjects selected for the study were distributed based on their age and gender in order to ascertain the age as well as gender related differences that existed among the subjects. The data revealed that among 19 years old, 18.69 and 18.12 per cent were males and females respectively; while among those aged 20 years, 16.06 and 15.86 per cent were males and females respectively. Around 17.88 and 21.06 per cent of the selected male and female subjects were 21 years old while about 20.71 and 21.06 per cent of selected males and females respectively were 22 years old. Almost equal number of 11.92 and 11.55 per cent of males and females respectively were 23 years of age and remaining 14.74 and 12.35 per cent of males and females respectively were 24 years old. National Family Health Survey 3 data (2005-06) states that the Youth in India constitutes one-fifth of the total population whose health and wellbeing is an asset for the development of a nation.

Distribution of subjects based on Body Mass Index (BMI) and gender

The mean Body Mass Index (BMI) and prevalence of obesity, overweight and underweight among the subjects are illustrated in graph 1 based on their gender



Graph 1 Distribution of the subjects based on BMI and gender

Rapid rise in obesity in India emphasizes the importance to predict the "weight of the nation." Due to the long-term consequences, the cost burden of obesity on the health care system is enormous. A better understanding of the numbers and causes can help to overcome barriers for primary prevention of obesity among children as well as adults (Ramachandran and Snehalatha, 2010).

Prevalence of overweight among the selected subjects was found to be higher among females (22.87%) than males (13.33%). The mean Body Mass Index of overweight males and females were found to be 24.28 ±0.46 and 23.97 ±0.53 respectively. Among the selected subjects, 62.12 per cent of the male subjects had a normal Body Mass Index while only 37.37 percent of the females had a normal Body Mass Index. However the mean Body Mass Index of normal male (20.78 ±1.30) and female (20.68 ±1.24) subjects were found to be more or less similar. The prevalence of underweight was higher among the female (16.53%) than among male subjects (5.35%).

The mean Body Mass Index of underweight male and female subjects was found to be 18.25 ±0.21 and 17.13 ±1.00 respectively. Higher prevalence of underweight and lower mean Body Mass Index among female subjects may be attributed to the fact that males concentrate on muscle building while females are figure conscious during their transformation from late adolescence to early adulthood.

Age wise distribution of the subjects based on height

The age wise distribution of the subjects based on height with respect to age are given in Table 3

The age wise distribution of the subjects based on height revealed that the mean height of the male subjects were higher than the mean height of the female subjects among all the groups except the obese subjects who belonged to the 19 and 20 years group.

Stratification of mean height based on body mass index and age revealed that the mean height of the males were 174.88 ± 4.94 in the 23 years age group and the females were 157.59± 5.74 in the 20 years age group which was found to be the highest among underweight subjects.

Among the normal subjects, the mean height based on the Body Mass index was the highest 167.93 ± 8.88 for the males in the 22 years age group and the females 158.39± 7.16 in the 23 years age group. In the overweight individuals studied, the mean height based on the Body Mass Index showed the maximum in the males 162.73±9.35 belonging to the 19 years age group whereas it was the 24 years in the females(159.20±8.81).The mean height was found to be the highest in the males (164.6±10.5) who were 22 years of age and the females (162.36±8.82) who were 19 years of age among the obese subjects.

Age wise distribution of the subjects based on weight

The mean weight of the subjects corresponding to their age are presented in Table 4

Table 3 Agewise distribution of the subjects based on height(cm)

N = 1873

Age (years)	Underweight (199)		Normal (945)		Overweight (334)		Obese (395)	
	Male (53)	Female (146)	Male (615)	Female (330)	Male (132)	Female (202)	Male (190)	Female (205)
19+	168.80 ±7.55	156.97 ±3.74	167.45±7.79	157.00 ±5.64	162.73 ±9.35	158.18 ±8.12	160.25 ±10.61	162.36 ±8.82
20+	167.11 ±5.47	157.59 ±5.74	167.10±8.68	157.41 ±5.33	160.29 ±7.68	158.61 ±11.03	160.4 ±9.00	162.06 ±9.73
21+	167.63 ±7.91	156.83 ±4.46	163.99±9.38	157.15 ±5.85	160.24 ±8.35	157.33 ±10.39	160.50 ±8.29	160.72 ±8.90
22+	168.41 ±7.02	156.69 ±5.30	167.93±8.88	157.02 ±5.90	160.64 ±8.08	158.18 ±10.53	164.6 ±10.5	160.73 ±9.74
23+	174.88 ±4.94	155.88 ±3.83	166.48±9.71	158.39 ±7.16	161.22 ±9.88	155.20 ±6.28	159.1 ±6.5	160.64 ±10.14
24+	167.91 ±7.69	153.58 ±4.72	167.30±7.73	157.40 ±6.59	161.41 ±8.51	159.20 ±8.81	161.5 ±10.1	157.79 ±10.33

The age wise distribution of the subjects based on weight revealed that the male subjects of all the age groups weighed more than the females excepting the obese female group irrespective of the age the mean weight of the male and female subjects were found to be highest among the obese group.

Table 4 Agewise distribution of the subjects based on weight(Kg)

N = 1873

Age (Years)	Underweight (199)		Normal (945)		Overweight (334)		Obese (395)	
	Male (55)	Female (146)	Male (615)	Female (330)	Male (132)	Female (202)	Male (190)	Female (205)
19+	52.07 ±4.26	41.38 ±4.05	57.98 ±5.97	51.58 ±5.37	64.45 ±8.02	60.18 ±6.21	68.20 ±8.28	71.97 ±11.21
20+	51.01 ±3.28	43.24 ±3.99	57.69 ±6.38	51.60 ±4.84	62.62 ±6.02	60.19 ±8.17	70.0 ±8.2	70.75 ±8.53
21+	51.03 ±4.72	41.90 ±3.72	56.30 ±6.85	50.38 ±4.77	62.64 ±6.73	59.49 ±8.00	68.67 ±7.64	72.52 ±11.81
22+	51.78 ±4.46	46.66 ±4.00	58.50 ±6.41	50.96 ±4.41	62.83 ±6.90	60.23 ±8.05	72.60 ±8.6	71.94 ±10.68
23+	56.33 ±3.09	41.19 ±3.67	57.45 ±6.29	51.95 ±5.26	63.51 ±8.87	58.13 ±5.18	68.30 ±5.5	70.56 ±10.31
24+	51.17 ±4.79	40.60 ±4.64	58.96 ±6.09	51.71 ±5.32	63.22 ±6.69	61.09 ±6.98	69.6 ±7.90	71.55 ±11.04

In the underweight group, the male subjects recorded a maximum of 56.33±3.09 who were 23 years of age whereas the females recorded a 46.66±4.00 who were 22 years of age. The maximum weight was 58.96±6.09 in the male subjects who were 24 years old and 51.95±5.26 in the female subjects who were 23 years old, both belonging to the normal category.

Among the overweight subjects studied, the males belonging to the 19 year age group recorded a maximum weight of 64.45±8.02 and in the females, the maximum weights recorded was 61.09±6.98 who belonged to the 24 years age group. The males who were 22 years of age were found to have the maximum weight of 72.60±8.6 and the females who were 21 years of age showed the maximum weight of 72.52±11.81 in the obese group.

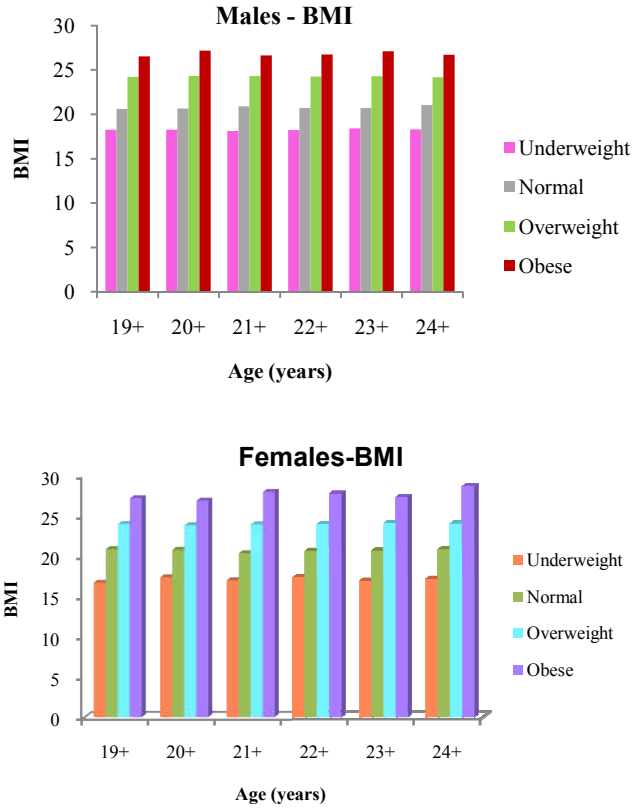
Age wise distribution of the subjects based on Body Mass Index (BMI)

Age wise distribution of the subjects based on body mass index are depicted in graph 2 Body Mass Index (BMI) is a simple measure of weight-for-height and is age-independent, same for both sexes and corresponds to same degree of fatness.

The BMI recorded for the subjects who belonged to the underweight category revealed that the males who were 21 years of age showed a minimum of 18.13 ± 0.25 and a maximum of 18.41±0.08 in those who were 23 years of age whereas in the females, the minimum BMI was 16.71±1.22 and a maximum of 17.38±0.78 in the 19 and 20 years respectively.

The normal male group had a maximum BMI of 21.04±1.28 (24 years) and a minimum BMI of 20.60±1.35 (19 years). In the normal female group, the maximum BMI was 20.88±1.21 (19 years) and the minimum BMI was 20.37±1.20 (21 years).

Among the overweight subjects, the maximum (24.33±0.38) BMI was recorded in the males who were 21 years of age and the minimum (24.20±0.41) was recorded in the males who were 24 years of age.



Graph 2 Agewise distribution of subjects based on Body Mass Index (BMI)Kg/m^2

A maximum of (24.09±0.61) BMI was recorded in the females who were 23 years of age and the minimum (23.84±0.53) was recorded in the females who were 20 years of age The BMI recorded for the obese males was found to be maximum 27.20 ±2.10 in those who were 20 years of age and it was found to be minimum 26.53±1.85 in those who were 19 years of age. Similarly, in the obese females, the maximum BMI was 28.68±3.07 in the 24 year age group and the minimum BMI was found to be 26.89±1.73 in the 20 year age group.

CONCLUSION

Body Mass Index is the best and simple measure to assess the prevalence of obesity and overweight among large population particularly in a community. Addressing the issue of obesity and overweight at young age would facilitate to plan treatment

strategy and help in preventing the onset of various chronic diseases. The financial burden and severity of complication could be greatly reduced by addressing this issue on an emergency basis. Health status of the young adult is one of the main contributing factors that would uplift the economic prosperity of the country. Focusing on health and nutrition of young adult is the need of the hour.

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