

Prevalence of Obesity in Young Adults of District Gurdaspur, Punjab

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ABSTRACT

Background: The aim of the present study was to estimate the overweight and obesity among young college going adults using different obesity standards.

Materials and method: The study was conducted on 1000 individuals in age range of 16-23 years (mean age: 19.35 ±2.27 yrs.) belonging to urban and rural areas of near and far vicinity attending local educational institutes in the township of Batala in the year 2016-17. The study was carried out on a sample of 1000 students with 606 girls (urban: 384; rural:222) and 394 boys (urban:229 ; rural:165). The exclusion criteria included chronic or any other infectious ailment. Applying standard methodology of Weiner and Lourie (1981), anthropometric measurements like Height, Weight, Waist Circumference (WC) and Hip Circumference (HC) were taken. Prevalence of overweight and obesity was measured using four criteria - Body Mass Index (BMI), Waist Circumference (WC), Waist-Hip-Ratio (WHR) and Waist-to-Height-Ratio (WHtR).

Results: With BMI as a criterion, prevalence of obesity was 21.06% in males and 12.70% in females and it was 10.91% and 4.95% respectively using waist circumference, 13.19% and 21.12% using waist hip ratio and 10.15% and 6.93% with waist to height ratio taken as criteria.

Discussion: Sedentary behaviour significantly affected BMI, WC, WHR and WHtR in female subjects while in males WC and WHtR was observed to get affected. Physical activity affected BMI, WC, WHtR in males while it had no influence in females since the level of physical activity was abysmally low.

A good and significant agreement was indicated by Kappa values among BMI, WC and WHtR however, it was moderate with respect to WHR in all age groups as well as on the basis of sex.

Keywords: Weight, BMI, WC, HC, WHR, WHtR.

INTRODUCTION

Overweight and obesity are major causes of co-morbidities including type-II diabetes, cardio-vascular diseases, various cancers and other health problems which can lead to further morbidity and mortality.

[1] Obesity means a condition of abnormal or excessive fat accumulation in adipose tissue.

[2] The amount of excess fat in absolute terms and its distribution in the body either around the waist and trunk (abdominal, central or android obesity) or peripherally around the body (gynoid obesity) has important health implications. This public

health problem has become an epidemic worldwide. As per a WHO report, obesity has nearly tripled worldwide since 1975. [3] WHO report published in 2016, revealed that more than 1.9 million adults over eighteen years of age and older were reported to be overweight. Of these over 650 million were obese and over 340 million children and adolescents aged 5-19 years were overweight or obese. [4] If secular trend continues by 2030 an estimated 38% of the world's adult population will be overweight and another 20% will be obese.

[5] In USA the dire projections based on

earlier secular trends point to over 85% of adults being overweight or obese by 2030. Obesity is a multifactorial disease and it occurs in all ages and commonly affects the health of infants, adolescents and elderly. Even being overweight seems to predispose one to type-II diabetes, hypertension, stroke, heart attack, congestive heart failure and several cancers. Obesity and overweight are the fifth leading causes of global deaths. [6] As per NFHS-4, in past ten years the number of obese people has doubled in India and more than 135 million individuals were affected by obesity. [7,8] Sedentary behaviour was significantly associated with obesity in both sexes compared to non-obese men and women. [9-14] Low physical activity and a sedentary lifestyle contribute to overweight or obesity in children. [15] The literature supports the inclusion of physical activity as important lifestyle behaviour for regulating body weight. [16] Physical activity is inversely associated with weight gain and the incidence of obesity. [17]

In the present study an attempt has been made to assess the level of overweight and obesity in young adults of Batala using various established obesity criteria viz. BMI, WC, WHR and WHtR and to ascertain the impact of sedentary behaviour and physical activity over obesity.

METHODOLOGY

The study included 1000 students with 606 girls (urban:384 ; rural:222) and 394 boys (urban:229 ; rural:165) in the age range of 16-23 years attending local educational institutes in the township of Batala in the year 2016-17. The exclusion criteria included chronic or any other infectious ailment. A written consent was obtained from all the subjects included in study. The information was collected through a self-administered questionnaire as regard their sedentary behaviour. Physical activity level was assessed by referring to WHO global physical activity questionnaire [18]

Standard methodology of Weiner and Lourie (1981) was implied to measure

height, weight, waist circumference and hip circumference. [19] Obesity indicators viz. Body Mass Index (BMI), Waist Circumference (WC), Waist-Hip-Ratio (WHR) and Waist-to-Height-Ratio (WHtR) were used to assess the level of obesity. BMI was calculated as per WHO (2000) criteria, [20] with BMI <18.5 being underweight, 18.5-22.9 as normal, 23.0-24.9 as overweight, 25.0-29.9 to be obese I and >30 as obese II. WC \geq 85 cm in men and \geq 80 cm in women; WHR \geq 0.89 cm in males and \geq 0.81 cm in females, [21] and WHtR >0.50 cm is considered as abdominal obesity. [22]

RESULTS

Sedentary behaviour was ascertained through time spent in front of television, video games, mobile phones and computers. Lethargic or sedentary behaviour was prevalent in the studied population and on an average 7.89 ± 1.60 hr in boys and 6.84 ± 1.47 hr in girls (Table 1) were recorded to be spent in inactive state with boys having significant ($f=113.29$; $p<0.000$) predominance in being sedentary.

Average time on usage of mobile was 3.17 ± 0.95 hr/day in males and 2.31 ± 1.09 hr/day in females with a significant difference ($f=8.24$; $p=0.004$). Depending upon the physical activity carried out and time spent for it per day, the physical activity level was assessed for low, moderate and high levels. A marked level of significant difference ($\chi^2=160.69$; $p<0.000$) was present in boys and girls with 55.83% of males and 90.43% of females having lower physical activity level. 42.64% of males and only 9.40% females reported moderate level of physical activity while higher level of activity was reported only in 1.52% of males and 0.17% of females. Boys (1.46 ± 0.53 hr) were involved for a significantly higher mean time ($f=186.61$; $p<0.000$) in physical activity compared to the girls (1.19 ± 0.30 hr).

Table 1: Mean and standard deviation of time spent w.r.t. Sedentary Behaviour and Physical Activity in college-going boys and girls

Variables	Distribution of sex				Total		f-value	p-value
	Male		Female		Mean	S.D.		
	Mean	S.D.	Mean	S.D.				
Sedentary habits: (hr./day)								
Television	2.26	0.88	2.34	0.83	2.31	0.85	1.41	0.234
Computer	1.37	0.69	1.17	0.48	1.25	0.58	95.64*	0.000
Video games	1.09	0.37	1.02	0.18	1.05	0.27	66.55*	0.000
Mobile phone	3.17	0.95	2.31	1.09	2.65	1.07	8.24*	0.004
Total Sedentary time spent	7.89	1.60	6.84	1.47	7.26	1.60	113.29*	0.000
Physical activity	1.46	0.52	1.10	0.32	1.24	0.44	186.61*	0.001
Level of physical activity:								
	N	%	N	%	N	%	χ^2	P
Low	220	55.83	548	90.43	768	76.8		
Moderate	168	42.64	57	9.40	225	22.5	160.69*	0.000
High	6	1.52	1	0.17	7	0.7		

* Significant at p<0.01

Mean value of BMI in male and female subjects (Table 2) was in close approximation in age groups 18-19 yrs and 22-23 yrs. while in the rest of two age groups it differed significantly amongst gender. Urban and rural peers also had their BMI almost in the same range. As discernible from Table 2, waist circumference was significantly higher in all age groups with boys having higher girth measurements. There was no significant difference amongst ones belonging to rural or urban areas. In total data the mean waist circumference for boys (71.93±9.90cm) and

girls (63.96±9.36cm) was significantly different (f = 165.50; p = 0.000). WHR was different significantly amongst male and female individuals in age group 16-17yrs. and 20-21yrs. as well in overall data (f =7.10; p = 0.008). The index was almost similar in subjects of urban and rural areas with no significant difference. Waist to height ratio (Table 2) was again to the highest level in age group 20-21 in both boys (0.44 ± 0.05) and girls (0.42±0.06). Urban individuals had a significantly higher ratio of WHtR (10.328) at P<0.001.

Table 2: Mean, S.D. and t/f value of various obesity criteria

Obesity Criteria					
Age grps. (Yrs)	Sex	BMI	WHR	WHtR	W.C.
		Mean ±S.D.	Mean ±S.D.	Mean ±S.D.	Mean ±S.D.
16-17	Male	21.37±3.98	0.80±0.11	0.42±0.05	70.54±9.66
	Female	19.99±3.40	0.75±0.08	0.40±0.05	62.05±8.37
	f; p-value	2.948*;0.004	4.069*;0.000	2.613*;0.010	7.470*;0.000
18-19	Male	21.63±3.39	0.80±0.06	0.42±0.05	71.70±9.49
	Female	20.46±3.73	0.80±0.04	0.41±0.05	64.03±9.46
	f; p-value	2.719*;0.007	0.173;0.863	1.848;0.066	6.778*;0.000
20-21	Male	22.50±3.15	0.83±0.06	0.44±0.04	75.15±8.46
	Female	20.90±3.65	0.76±0.10	0.42±0.06	64.76±9.12
	f; p-value	3.336*;0.001	5.450*;0.000	3.420*;0.001	8.478*;0.000
22-23	Male	22.28±3.52	0.81±0.09	0.42±0.06	70.97±11.52
	Female	21.86±3.99	0.79±0.09	0.41±0.06	64.85±10.13
	f; p-value	0.775;0.439	1.649;0.101	1.432;0.153	4.140*;0.000
Urban	Male	22.06±3.48	0.81±0.08	0.44±0.05	72.93±9.90
	Female	20.82±3.78	0.78±0.24	0.41±0.05	63.96±9.35
	f; p-value	16.832*;0.000	2.803;0.095	5.381*;0.000	122.559*;0.001
Rural	Male	21.52±3.66	0.81±0.10	0.42±0.06	70.58±10.30
	Female	20.78±3.75	0.77±0.09	0.40±0.06	63.56±9.32
	f; p-value	4.389**;0.037	3.408*;0.000	4.981;0.026*	49.019;0.000*
Urban/Rural	f; p-value	0.467;0.495	0.195;0.659	10.328*;0.001	1.750;0.186
Total	Male	21.86±3.57	0.81±0.09	0.43±0.06	71.93±9.90
	Female	20.80±3.76	0.78±0.25	0.41±0.06	63.96±9.36
	f; p-value	19.851;0.000*	7.102;0.008*	18.097;0.000*	165.501;0.000*

* Significant at p<0.01; ** Significant at p<0.05

DISCUSSION

As charted in Table 3, with BMI as a criterion for assessment of generalized

obesity, most of the young boys and girls were either normal or underweight. The number of overweight and obese individuals

showed an increase with age and a maximum number of overweight subjects were confined to age group 22-23 yrs. with a percentage value of 25% in males and 20.40% in females. In India, many studies have shown that the prevalence of overweight among adolescents varies between 10% to 30% [23-27] and highest percentage of obese women (29.9%) is found in Punjab. [28] In the studied cohort, abdominal obesity as indicated through WC also deciphered a surge in obesity with increase in age (Table 3), wherein 13.75% male and 7.48% females individuals being obese in age group 22-23 yrs. WHR index, to assess abdominal obesity, was significantly different in male and female in age group 22-23 yrs. ($\chi^2 = 9.434$; $p = 0.002$)

with a higher number of girls (34.01%) rather than boys (15%) being obese. WHtR, depicted no significant difference in male and female individuals of different age groups except age group 20-21 yrs. ($\chi^2 = 4.40$; $p = 0.036$). In studied individuals, generalized obesity as indicated by BMI depicted 21.06% and 12.70% of males and females, respectively to be obese whilst, abdominal obesity as per WC, WHR and WHtR placed it at 10.91% and 4.95%, 13.19% and 21.12%, 10.15% and 6.93% respectively. A study carried out by ICMR-INDIAB (Phase -1) [29] presented a higher prevalence of generalized and abdominal obesity in India but contrary to the present study the prevalence of abdominal obesity was higher than the generalized obesity.

Table 3: Percentage prevalence of over-weight in different age groups using BMI.

Age grps. (Yrs)	Sex	N	BMI N (%)	WHR N (%)	WHtR N (%)	W.C. N (%)
16-17	Male	115	22 (19.13)	15 (13.04)	10 (8.70)	12 (10.43)
	Female	137	13 (9.48)	25 (18.24)	8(5.83)	5 (3.64)
	χ^2 :p-value		5.974;0.113	1.268;0.260	0.769;0.381	4.575**;0.032
18-19	Male	117	24 (20.51)	12 (10.25)	7 (5.98)	10 (8.54)
	Female	175	18 (10.28)	30 (17.14)	15 (8.57)	10 (5.71)
	χ^2 :p-value		10.046**;0.018	2.700;0.100	0.674; 0.412	0.882;0.348
20-21	Male	82	17 (20.73)	13 (15.85)	11 (13.41)	10 (12.19)
	Female	147	16 (10.88)	23 (15.64)	8 (5.44)	4 (2.72)
	χ^2 :p-value		12.004*;0.007	0.002;0.967	4.397**;0.036	8.231*; 0.004
22-23	Male	80	20 (25.00)	12 (15.00)	12 (15.00)	11 (13.75)
	Female	147	30 (20.40)	50 (34.01)	11 (7.48)	11 (7.48)
	χ^2 :p-value		2.974;0.562	9.434*;0.002	3.215; 0.073	2.325;0.127
Urban	Male	229	48 (20.96)	27 (11.79)	22 (9.60)	23 (10.04)
	Female	384	52 (13.54)	72 (18.75)	31 (8.07)	21 (5.46)
Rural	Male	165	35 (21.21)	25 (15.15)	18 (10.90)	20 (12.12)
	Female	222	25 (11.26)	56 (25.22)	11 (4.95)	9 (4.05)
Urban/Rural	χ^2 :p-value		2.030;0.730	3.673;0.055	0.419;0.518	0.035;0.852
Total	Male	394	83 (21.06)	52 (13.19)	40 (10.15)	43 (10.91)
	Female	606	77 (12.70)	128 (21.12)	42 (6.93)	30 (4.95)
	χ^2 :p-value		21.539*;0.000	10.158*;0.001	3.292;0.070	12.547*;0.001

* Significant at $p < 0.01$; ** Significant at $p < 0.05$

In the studied population a close approximation for generalized overweight and obesity, as indicated by BMI, was observed in urban and rural males while it was higher in urban females (13.84%) rather than the rural ones (11.26%). Abdominal obesity as per WC was slightly higher in studied rural males (rural: 12.12%; urban: 10.04%) and urban females (rural: 4.05%; urban: 5.46%). A significantly higher percentage of rural individuals both boys (rural: 15.15%; urban: 11.79%) and girls (rural: 25.22%; urban: 18.75%) was

perceived as per WHR. Carried out analysis based upon WHtR did indicate a higher percentage in rural (10.90%) and urban females (8.07%) in abdominal obesity index. However, ICMR-INDIAB study (Phase -1) reported a high prevalence of both generalized and abdominal obesity in urban residents than the rural residents, and in concurrence to the present study, it shows a large increase in prevalence of obesity not only in urban areas but also in rural areas in India. [29] Rural population in India was reported to have increased prevalence of

generalized obesity (56%) abdominal obesity (71.2%) and combined obesity (51.1%).^[30] However, in adult population of China it was the highest in city (10.1%) than the township (7.3%) and rural areas (6.5%).^[31] A survey report of NFSH-4 categorised a higher percentage of urban individuals (male: 28%; female: 45.6%) to be obese compared to rural beings (male: 28%; female: 27.6%) in Andhra Pradesh and in Punjab 27.8% of males and 31.1% of females were projected to be so.^[7] Another study on Punjab reported a higher prevalence of obesity in urban population (43.8%) as compared to rural (22.6%).^[32]

The present study pointed out that sedentary behaviour (Table 4) could be significantly correlated with BMI, WC, WHR and WHtR in female subjects while in males only WHtR was seen to be affected. Physical activity (Table 4) affected BMI, WC, WHtR in males while it had no influence in females as the level of physical activity was highly deplorable with 90.4% of females categorised for low physical activity level. In similarity to the present study, sedentary behaviour had been reported to be significantly associated with obesity in both sexes compared to non-obese men and women.^[9]

Table 4: Correlation values ‘r’ of various obesity criteria with sedentary behaviour and physical activity w.r.t. BMI, W.C., WHR, WHtR in college-going boys and girls.

Variables	Sex	BMI r; p-value	WC r; p-value	WHR r; p-value	WHtR r; p-value
Sedentary time spent (hr/day)	Male	0.091;0.070	0.109**;0.031	0.018;0.720	0.134*;0.008
	Female	0.119* ;0.003	0.148 *;0.000	0.134* ; 0.001	0.135* ;0.001
	Total	0.146 *;0.000	0.236* ;0.000	0.122 *;0.000	0.169 *;0.000
Physical activity (hr/day)	Male	0.115**;0.023	0.170 *;0.001	0.093; 0.064	0.112 *;0.026
	Female	-0.023;0.579	-0.029 ;0.471	-0.039;0.337	0.027;0.512
	Total	0.098 *;0.002	0.237 *;0.000	0.033; 0.303	0.116 *;0.000

* Significant at p<0.01; ** Significant at p<0.05

Table 5: kappa statistics for obesity indictors BMI, WHR and WHtR w.r.t. age groups in college going boys and girls.

BMI	(16-17 yrs.)				(18-19 yrs.)				(20-21 yrs.)				(22-23 yrs.)			
	Normal	Obese	Total	Kappa (p-value)	Normal	Obese	Total	Kappa (p-value)	Normal	Obese	Total	Kappa (p-value)	Normal	Obese	Total	Kappa (p-value)
WC																
Normal	212	5	217		245	5	250		194	2	196		173	3	176	
Obese	23	12	35	0.408*	27	15	42	0.431*	21	12	33	0.465*	32	19	51	0.445*
				(0.000)				(0.000)				(0.000)				(0.000)
Total	235	17	252		272	20	292		215	14	229		205	22	224	
WHR																
Normal	118	29	217		220	30	250		171	25	196		140	36	196	
Obese	24	11	35	0.170*	30	12	42	0.166*	22	11	33	0.198*	25	26	51	0.284*
				(0.000)				(0.000)				(0.000)				(0.000)
Total	212	40	252		250	42	292		193	36	229		165	62	227	
WHtR																
Normal	211	6	217		242	8	250		190	6	196		173	3	176	
Obese	23	12	35	0.396*	28	14	42	0.376*	20	13	33	0.441*	31	20	51	0.466*
				(0.000)				(0.000)				(0.000)				(0.000)
Total	234	18	252		270	22	292		210	19	229		204	23	227	

* Significant at p<0.01; ** Significant at p<0.05

Sedentary behaviour like television viewing had been reported to be associated with increased risk of all-causes of cancer and cardio-vascular mortality. Promotion of exercise and reduced sitting time particularly television viewing were advocated to be the preventive strategies.^[33] A higher level of physical activity and less time spent on sedentary behaviour are associated with increased health-related quality of life among general population of children and adolescents^[34] and there is a significant association between physical

activity and obesity, as defined by WHtR than BMI was reported.^[35]

To test inter-rater reliability among various obesity criteria i.e. BMI, WC, WHR, WHtR, Kappa statistics was implied as it represents the extent to which the data collected is correct representation of the variables. This refers to the degree to which different raters give consistent estimates of the same behaviour. Kappa values (Table 5) did decipher a good and significant agreement amongst BMI, WC and WHtR, however it was moderate with respect to

WHR in all age groups as well as on the basis of sex.

CONCLUSION

It could be concluded from the present study that both generalized and abdominal obesity showed a rising trend with age and could be directly correlated with sedentary behaviour.

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