Research Article

Obesity and comorbid conditions: An urban population-based cross-sectional study in Northwest India

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ABSTRACT

Background: Obesity of late has become a challenge for public health planners both in developing as well as the developed nations. Obesity has assumed pandemic proportions worldwide. **Objectives:** (1) To determine the prevalence of obesity in urban adults aged 30 years and above. (2) To find the common comorbid conditions associated with obesity. **Material and Methods:** Using systematic random sampling, the current cross-sectional study was conducted among urban adults ≥ 30 years of age using a pre-designed, pre-tested, and pre-structured questionnaire. Information regarding sociodemographic profile and current health status were recorded. Anthropometric data regarding height and weight were also taken. The data thus collected were analysed, and Chi-square was used as the test of significance. **Results:** Overall prevalence of obesity and overweight in both sexes was 26.43% and 43.69%, respectively. Hypertension was the most common comorbid condition. Among the various risk factors, age, sex, and socioeconomic status were significantly associated with body mass index (BMI) ($P < 0.05$). **Conclusion:** The trends show a high prevalence of both obesity as well as overweight which is a cause of concern. Therefore, the need for early detection to prevent obesity-associated complications is of prime concern. Despite emergence of new tools, BMI remains safe and effective tool not only to calculate but also to detect pre-obesity at an incipient stage.

KEY WORDS: Body Mass Index; Obesity, Comorbid Conditions; Urban Area

INTRODUCTION

The past century witnessed a tremendous progress in the field of science and technology. This resulted in making the life a lot easier for the people worldwide along with the emergence of non-communicable diseases (NCDs) epidemic in the form of cardiovascular disorders, hypertension, osteoarthritis, and obesity among others.[1] NCDs are emerging as a major health challenge in South Asians, which encompass residents of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, and Maldives, constituting 24% of the world's population.[2]

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Obesity was recognized as a major health problem in 1998.[3] Obesity, which made its presence felt first in the Northern Hemisphere, has now taken a pandemic look affecting practically almost all the countries of the globe. Obesity is not just limited to urban and affluent society but also affects the rural places and persons belonging to the lower socioeconomic strata. Body mass index (BMI) has been one of the easiest ways to determine the transition of a person from normal weight to obesity. It is simple to calculate, and it categorizes a person as underweight, normal, overweight, and obese with its stages.[4]

Overweight and obesity substantially increase the risk of premature morbidity and mortality due to excess body fat accumulation which affects individuals health negatively.[5] Obesity contributes to numerous and varied comorbid conditions. Complications can occur in many organ systems, ranging from cardiovascular to respiratory

to orthopedic and even ophthalmologic. Overweight and obesity are known risk factors for heart disease, diabetes, hypertension, gallbladder disease, osteoarthritis, sleep apnea and other breathing problems, and some cancers (uterine, breast, colorectal, kidney, and gallbladder). In addition, obesity is associated with pregnancy complications, high blood cholesterol, menstrual irregularities, hirsutism (excessive hair growth), stress incontinence, psychological disorders, and increased surgical risk. Social discrimination against obese persons has a strong negative effect on their quality of life. As the global health, community works to develop treatments and prevention policies to address obesity, timely information about levels of high BMI and health effects at the population level is needed.

Globally, the prevalence of obesity has doubled in the past two decades. In 2008, more than 1.6 billion adults over 20 years were overweight, of these, over 200 million men and nearly 300 million women were obese.[2] As per 2014 estimates, 39% adults aged 18 years and above were overweight and 13% were obese.[6] The pandemic is growing at such a pace that even prevalence studies become rapidly outdated. Regular monitoring and up-to-date information about levels and trends is essential to quantify population health effects so as to prioritize the action.[7] The causes of obesity are multifactorial including genetic, biological, social, and environmental determinants acting singularly or in tandem affecting weight gain through mediators of energy metabolism and physical activity.[8] Morbid obesity affects 5% of Indian population with trends similar to other developing countries.[9]

As the pandemic of overweight and obesity around the globe continues to rise, many developing countries face a double burden of over nutrition and under nutrition. The scope and distribution of both types of malnutrition must be understood so that public health resources can be channeled appropriately. In recent years, India has controlled the problem of severe under nutrition to a substantial extent among young children but is now facing a rising epidemic of overweight and obesity among children and adults. Only limited data on prevalence of overweight and obesity are available for adults in India.[10]

During review of literature, it was found that though many studies have been conducted in different parts of the country on obesity prevalence, there was paucity of literature regarding obesity prevalence in our state of Jammu and Kashmir. It was in this context that the present study was planned with the aim to find the prevalence of obesity in urban adults aged 30 years and above along with associated comorbid conditions. The results of this study would reflect the current trends of the obesity in this region of India so that necessary intervention strategies could be implemented to combat this modern epidemic.

MATERIALS AND METHODS

After taking approval from Institutional Ethical Committee, the present population-based study was conducted at Trikuta Nagar Colony of Jammu city which happens to be urban field practice area of Community Medicine department, Government Medical College, Jammu. A detailed list of all the households was procured and all the households were numbered. In the next step using systematic random sampling every third house was chosen for the conduct of the study. All the houses which were closed during first visit were visited second time and if again found closed, were excluded from the purview of the study. All the adults aged 30 years and above in the selected houses were briefed about the purpose of the study and informed verbal consent was taken before the questionnaire was administered. The information so obtained was recorded on a pre-designed, pre-tested, and pre-structured questionnaire. The standard questionnaire contained information on demographics, and any of the associated comorbid conditions. Socioeconomic status of study participants was recorded as per Kuppuswamy scale. It was followed by anthropometric measurements of the participants.

Anthropometric measurements included height and weight. The standing height was recorded up to the nearest centimeter. Participant was asked to stand on the flat surface against vertical wall with the shoes taken off and with heels, buttocks, shoulders, and back of the head touching the wall. A scale was kept over the head to meet the vertical surface at right angles and mark was put on the wall and height was recorded using a wall mounted, non-extendable measuring tape.

For weight recording, the participants were asked to stand on the bathroom weighing machine placed horizontally on a leveled surface without footwear and with minimum covered clothing's. The reading was recorded to the nearest of 500 g.

BMI was calculated using the expression = Weight (kilograms)/Height^2 (meters). The cutoff point for calculation of overweight/preobesity taken was $\geq$25 kg/m^2 and for obesity was $\geq$30 kg/m^2 as per the WHO 2000 guidelines.[11] The blood pressure was recorded as per standard protocol and mean of three readings was recorded.

Information on physical activity was recorded as per the recommendations of the WHO expert Committee. The study participants who were already diagnosed as cases of diabetes mellitus, hypertension, and hypothyroidism as per available prescription were all considered to be suffering from comorbid conditions. The newly diagnosed cases of hypertension during the course of study were also included as far as comorbidity was concerned.

The data thus collected were thoroughly checked for its consistency. It was tabulated and analyzed with Chi-square

test used as test of significance. The $P < 0.05$ was considered statistically significant.

RESULTS

During the course of study, 478 houses were surveyed. The total study population was 1078 comprising of 449 males (41.65%) and 629 females (58.35%). Of the surveyed population 474/1078 (43.97%) population were of more than 60 years of age. Mean age of population was 54.63 years ± 14.94 standard deviation (SD) with mean age of females 52.54 years ± 15.74 SD and mean age of males 57.54 years ± 13.73 SD. 1065/1078 (98.79%) belonged to upper and upper middle class and only 13/1078 (1.21%) belonged to lower middle class (Figure 1). The majority of males in study population (83.29%) were graduate and above and the corresponding figure for females was 66.30%. Only 29/1078 (2.69%) of study population was illiterate. Of the surveyed families 428/478 (89.54%) belonged to the Hindu religion.

The results have revealed that 28.48% (307/1078) of the participants were in normal weight range while 16/1078 (1.48%) were in underweight category (Table 1 and Figure 2). Overall prevalence of obesity was 26.34% (284/1078) while 43.69% (471/1078) of the participants were in the category of overweight/preobese. On the basis of sex, the prevalence of obesity was 16.25% and 33.54% in males and females, respectively (Table 2). Among the obese, 205/284(72.18%) had class I obesity and 56/284 (19.72%) had class II obesity while only 23/284 (8.1%) had Class III obesity. Sex-wise prevalence of overweight was 45.66% and 42.29% in males and females, respectively.

Table 1: Distribution of study population according to BMI

Classification	BMI	*n* (%)		Total
		Male	Female	
Underweight	<18.50	6 (1.34)	10 (1.59)	16 (1.48)
Normal range	18.50-24.99	165 (36.75)	142 (22.57)	307 (28.48)
Preobese	25-29.99	205 (45.66)	266 (42.29)	471 (43.69)
Obesity Class I	30-34.99	63 (14.03)	142 (22.57)	205 (19.02)
Obesity Class II	35-39.99	7 (1.56)	49 (7.79)	56 (5.19)
Obesity Class III	≥40	3 (0.67)	20 (3.18)	23 (2.13)
Total		449 (100)	629 (100)	1078 (100)

BMI: Body mass index

Table 2: Prevalence of overweight and obesity in the study population

Gender	Study population (*n*)	*n* (%)	
		Overweight	Obese
Males	449	205 (45.66)	73 (16.25)
Females	629	266 (42.28)	211 (33.54)
Total	1078	471 (43.69)	284 (26.34)

Regarding prevalence of comorbid conditions among the participants, hypertension was the most common (58.2%) followed by diabetes and hypothyroidism, respectively. A highly statically significant association was found between hypertension and BMI ($P < 0.05$) while no association was seen between diabetes mellitus and obesity ($P > 0.05$) (Table 3).

When association between various risk factors and BMI was assessed, a highly statistical significant association was found with age, sex, and socioeconomic status (Table 4).

DISCUSSION

The results of the current study have shown a prevalence rate of 26.34% and 43.69% for obesity and overweight, respectively. Thus, the combined prevalence of overweight and obesity was to the tune of 70.03%. Majority of the participants were in Grade I obesity. On the basis of gender, the prevalence of both overweight and obesity was higher in females (80.23%) than their male counterparts (61.92%). Among the comorbid conditions associated with obesity, a highly significant statistical association was found with hypertension ($P < 0.05$).

These results are in agreement with those reported by Shukla et al.[12] in Mumbai while Asthana et al.[13] and Mithu et al.[14] reported 30.24% and 17.45% prevalence of obesity in affluent female population. The current results also concur with those reported by Tiwari et al.[4] where both sexes had higher

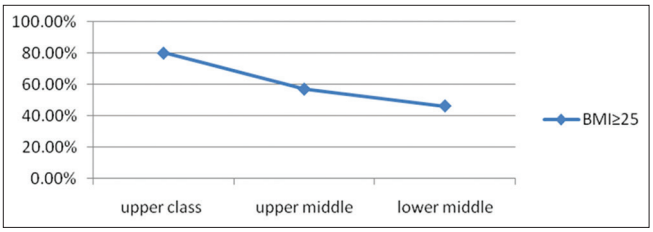

Figure 1: Study population (body mass index ≥25) as per their socioeconomic status

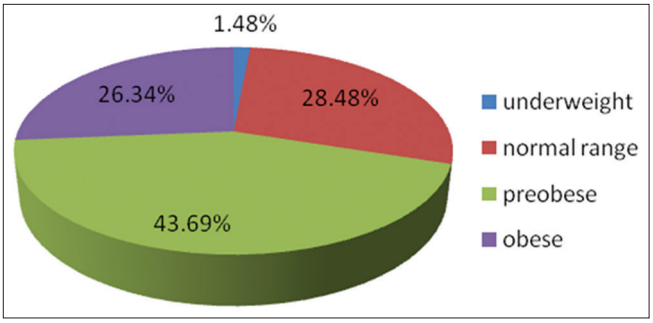

Figure 2: Distribution of study population on the basis of body mass index

Table 3: Association of BMI with hypertension and diabetes

BMI	Blood pressure		Diabetes	
	Hypertensive	Normotensive	Diabetic	Non diabetic
≥25	471	283	115	639
<25	157	167	46	278
Total	628	450	161	917
P value	0.000		0.66	

BMI: Body mass index

Table 4: Various risk factors in relation to BMI

Variables	BMI<25	BMI≥25	*P* value
Age (years)			
30-39	77 (33.48)	153 (66.52)	<0.000
40-49	49 (24.62)	150 (75.38)	
50-59	33 (18.97)	141 (81.03)	
60-69	70 (25.45)	205 (74.55)	
≥70	94 (47.00)	106 (53.00)	
Sex			
Males	167 (37.78)	275 (62.22)	0.000
Females	156 (24.53)	480 (75.47)	
Physical activity			
Sedentary worker	288 (30.41)	659 (69.59)	0.39
Moderate worker	35 (26.72)	96 (73.28)	
Graduate and above	247 (31.31)	542 (68.69)	0.59
Education			
Intermediate	27 (27.84)	70 (72.16)	
High school	30 (23.26)	99 (76.74)	
Middle school	5 (27.78)	13 (72.22)	
Primary	5 (31.25)	11 (68.75)	
Illiterate	9 (31.03)	20 (68.97)	
Socioeconomic status			
Upper class	122 (18.87)	492 (80.13)	<0.000
Upper middle	194 (43.02)	257 (56.98)	
Lower middle	7 (53.85)	6 (46.15)	
Diet			
Vegetarian	184 (31.19)	406 (68.81)	0.33
Non vegetarian	139 (28.48)	349 (71.52)	

BMI: Body mass index

rates of overweight and obesity, namely, males (34.4%) and females (31.3%). However, Zargar et al.[15] in their study, in Kashmir valley reported very low rates of obesity to the tune of 7% and 23% for males and females, respectively. Similarly Midha et al.[16] also reported low levels of obesity in Kanpur. Raina and Jamwal[17] also reported contrasting results with low prevalence of obesity in the same district albeit in rural adults. The most prevalent comorbid condition in the present study participants was hypertension and similar trend was also reported by Saha et al.[18] and Gosh et al.[19] Gothankar[9] reported a statistically significant association between obesity and hypertension. Similar association was also reported by Swami et al.[20] at Chandigarh on participants over the age of 65 years. Colin Bell et al.[21] and Jia et al.[22] reported results which concur with the results of the present study. However, Raina and Jamwal[17] reported a lower rate of hypertension(13%) in rural adults as comorbidity in obese patients. The other important comorbid condition in the current study was type 2 diabetes mellitus (T2DM) though the prevalence in the present study was a bit higher than that reported by Jia et al.[22] In addition, no statistically significant association was found between obesity and T2DM. In contrast to our study, Gothankar[9] in his study reported statistically significant association between diabetes and obesity. The trend of progressive increase in BMI in the present study was seen from 30 years onward till 59 years with maximum prevalence of obesity in 50-59 year age group which was in line of agreement with Tiwari et al.[4] and Thankappan et al.[23] In addition, 69.59% of the respondents in the present study were sedentary workers on the basis of physical activity and it was found to be consistent with results reported by Khanam and Costarelli.[24] and Tiwari et al.,[4] although no significant association was found between obesity and physical activity. The results of the present study could be best explained in the urban settings with respondents living in a posh colony, having better economic conditions and affluence but with sedentary life patterns. Among other factors which could have contributed to higher rates of obesity and overweight include nutritional transition with more intake of energy dense foods and job nature of the respondents requiring long sitting hours.

The limitations of the current study include small sample size and its urban set up due to which it may lack generalizability. Another drawback is the lack of data on food consuming patterns which could have shown interesting facts. In light of these limitations, authors recommend more such studies in different parts of the country.

CONCLUSIONS

The prevalence rates of 26.34% and 43.69% for obesity and overweight, respectively, in this urban region of India are a worrying trend in the national perspective. Hypertension followed by T2DM was the main comorbidities in the study population. It would be prudent to add here that an overall integrated approach for the prevention and control of NCDs in general and obesity in particular as part of primary health-care systems, simultaneously attacking several risk factors know to be causative, needs to be followed religiously. Such concerted preventive action would reduce not only obesity but also other NCDS with resultant improvement in quality of life.

REFERENCES

1. Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL, editors. Harrison's Text Book of Internal Medicine.

16th ed. New York, NY: McGraw Hills; 2005. p. 422-9.
2. Misra A, Shrivastava U. Obesity and dyslipidemia in South Asians. Nutrients. 2013;5(7):2708-33.
3. WHO. Report of a WHO Consultation on Obesity. Preventing and Managing the Global Epidemic. Geneva: WHO; 1998.
4. Tiwari R, Srivastava D, Gour N. A cross-sectional study to determine prevalence of obesity in high income group colonies of Gwalior city. Indian J Community Med. 2009;34(3):218-22.
5. Sen J, Mondal N, Dutta S. Factors affecting overweight and obesity among urban adults: A cross-sectional study. Epidemiol Biostat Public Health. 2013;10(1). DOI: 10.2427/8741.
6. World Health Organisation. Fact Sheet No. 311. Available from: http://www.Searo.who.int/india. [Last accessed on 2017 Jun 09].
7. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014;384(9945):766-81.
8. Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: Public-health crisis, common sense cure. Lancet. 2002;360(9331):473-82.
9. Gothankar JS. Prevalence of obesity and its associated comorbities amongst adults. Natl J Community Med. 2011;2(2):221-4.
10. Sidhu S, Kumari K. Incidence of overweight and obesity among urban and rural males of Amritsar. J Exerc Sci Physiother. 2006;2:79-83.
11. Obesity: Prevention and Managing the Global Epidemic Report No. 894. WHO TRS; 2000. p. 20.
12. Shukla HC, Gupta PC, Mehta HC, Hebert JR. Descriptive epidemiology of body mass index of an urban adult population in western India. J Epidemiol Community Health. 2002;56(11):876-80.
13. Asthana S, Gupta VM, Mishra RN. Screening for obesity in affluent females: Body mass index and its comparison with skin fold thickness. Indian J Public Health. 1998;42(2):37-41.
14. Mithu B, Mukhopadhay A, Bose K. Overweight and obesity among Adult Bengalee Hindu women of Kolkata, India. Indian J Commun Dis. 1999;62:77-82.
15. Zargar AH, Masoodi SR, Laway BA, Khan AK, Wani AI, Bashir MI, et al. Prevalence of obesity in adults - An epidemiological study from Kashmir Valley of Indian subcontinent. J Assoc Physicians India. 2000;48(12):1170-4.
16. Midha T, Nath B, Kumari R, Krishna V, Rao YK, Pandey U. Prevalence and determinants of obesity in the adult population of Kanpur district -- A population-based study. J Indian Med Assoc. 2011;109(8):538-42.
17. Raina DJ, Jamwal DS. Prevalence study of overweight/obesity and hypertension among rural adults. JK Sci. 2009;11(1):20-3.
18. Saha I, Raut DK, Paul B. Anthropometric correlates of adolescent blood pressure. Indian J Public Health. 2007;51(3):190-2.
19. Ghosh JR, Bandyopadhyay AR. Comparative evaluation of obesity measures: Relationship with blood pressures and hypertension. Singapore Med J. 2007;48(3):232-5.
20. Swami HM, Bhatia V, Gupta AK, Bhatia SP. An epidemiological study of obesity Among Elderly in Chandigarh. Indian J Community Med. 2005;30(1):1-5.
21. Colin Bell A, Adair LS, Popkin BM. Ethnic differences in the association between body mass index and hypertension. Am J Epidemiol. 2002;155(4):346-53.
22. Jia WP, Xiang KS, Chen L, Lu JX, Wu YM. Epidemiological study on obesity and its comorbidities in urban Chinese older than 20 years of age in Shanghai, China. Obes Rev. 2002;3(3):157-65.
23. Thankappan KR, Shah B, Mathur P, Sarma PS, Srinivas G, Mini GK, et al. Risk factor profile for chronic non-communicable diseases: Results of a community based study in Kerala, India. Indian J Med Res. 2010;131:53-63.
24. Khanam S, Costarelli V. Attitudes towards health and exercise of overweight women. J R Soc Promot Health. 2008;128(1):26-30.

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