

## ORIGINAL ARTICLE

# Overweight and Obesity above 18 years of Age in An Urban Population

Amit Kumar Kamboj<sup>1</sup>, Harivansh Chopra<sup>2</sup>, Jai Vir Singh<sup>3</sup>, Sunil Kumar Garg<sup>4</sup>, Shailendra Kumar Bajpai<sup>5</sup><sup>1</sup>Assistant Professor, Department of Community Medicine, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India<sup>2</sup>Professor, Department of Community Medicine, Lala Lajpat Rai Memorial Medical College, Meerut, Uttar Pradesh, India<sup>3</sup>Professor, Department of Community Medicine, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India<sup>4</sup>Professor, Department of Community Medicine, Lala Lajpat Rai Memorial Medical College, Meerut, Uttar Pradesh, India<sup>5</sup>Associate Professor, Department of Community Medicine, Lala Lajpat Rai Memorial Medical College, Meerut, Uttar Pradesh, India

<a href="#">Abstract</a>	<a href="#">Introduction</a>	<a href="#">Methodology</a>	<a href="#">Results</a>	<a href="#">Conclusion</a>	<a href="#">References</a>	<a href="#">Citation</a>	<a href="#">Tables / Figures</a>
--------------------------	------------------------------	-----------------------------	-------------------------	----------------------------	----------------------------	--------------------------	----------------------------------

## Corresponding Author

Address for Correspondence: Dr Amit Kumar Kamboj, Assistant Professor, Department of Community Medicine, Muzaffarnagar Medical College, Muzaffarnagar, Muzaffarnagar, Uttar Pradesh 251001

E Mail ID: [amitkambojmd@gmail.com](mailto:amitkambojmd@gmail.com)



## Citation

Kamboj AK, Chopra H, Singh JV, Garg SK, Bajpai SK. Overweight and Obesity above 18 years of Age in An Urban Population. Indian J Comm Health. 2017; 29, 2: 151-155.

**Source of Funding:** Nil **Conflict of Interest:** None declared

## Article Cycle

**Received:** 01/05/2017; **Revision:** 10/05/2017; **Accepted:** 19/05/2017; **Published:** 30/06/2017

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

## Abstract

**Background:** Today however, as standard of living continues to rise, weight gain and obesity are posing a growing threat to health in both developed and developing countries and affecting children as well as adults. Indeed, it is now so common that it is replacing the more traditional public health concern including under nutrition and infectious diseases. Overweight and obesity is a major risk factor for high morbidity and mortality. Obesity is an independent risk factor for chronic heart disease related morbidity and mortality. **Aims and Objectives:** To find out the prevalence of overweight & obesity and to suggest measures for prevention of overweight and obesity in adult population. **Material and Method:** To cover a sample size of 1152 in Urban Health Centre area population  $\geq 18$  years every fifth family was selected by systematic random sampling from the total of 1698 families registered at Urban Health Centre. They were interviewed personally and information was collected about sociodemographic characteristics, personal factors, and measurements of weight, height, waist and hip circumference of the individuals were taken to calculate Body Mass Index (BMI) and Waist Hip Ratio (WHR). **Results:** Prevalence of overweight (BMI -25-29.99) and obesity (BMI  $\geq 30$ ) being 28.0% and 8.0% respectively. Prevalence of abdominal obesity was 25.8%. About two-third (66.9%) of abdominal obesity rightly corresponded with the high BMI (25+). **Conclusion:** The prevalence of overweight and obesity is increasing in urban area of Meerut, more in females than males and it is being affected by various socio-demographic correlates.

## Keywords

Overweight; Obesity; BMI; WHR

## Introduction

Obesity is often defined simply as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired (1). Obesity is a major risk factor for high morbidity and mortality. (2) The American Institute of nutrition, after analyzing numerous studies of obesity and

mortality risk, concluded that lowest mortality risk is associated with Body Mass Index (BMI) between 18 to 25. (3)

The problem of Obesity is a public health problem and it has become epidemic worldwide. Many epidemiological studies show the relationship between excess weight, abdominal fatness and risk of a wide range of illnesses (4, 5,6,7).

Research Fund and the American Institute for Cancer Research (2007) (8) suggested the relative risk of >3 for Type II diabetes, Gallbladder disease, Dyslipidemia, Insulin resistance and the relative risk of 1-2 for Coronary heart disease, Hypertension, Osteoarthritis was associated with Obesity (2,8). It also suggested that there was convincing evidence that overweight and obesity increased the risk of cancers of the esophagus, pancreas, colon and rectum, breast (postmenopausal), endometrium, and kidney. In addition, there was convincing evidence to support that abdominal fatness was a cause of colon cancer and may probably increase the risk of cancers of breast (postmenopausal) and endometrium.

There is a lot of evidence showing that over weight is an important risk factor in causing the other illnesses, including respiratory diseases (5), chronic kidney diseases (7), musculoskeletal disorders (9,10), gastrointestinal and hepatic disorders (11,12), lower physical functioning performance (13) and psychological problems (14).

In many developing countries, obesity co-exists with under nutrition (BMI<18.5). It is still relatively uncommon in African and Asian countries, but is more prevalent in urban than in rural populations. In economically advanced regions, prevalence rate may be as high as in industrialized countries. (14)

Some believe that overweight and obesity is not a problem in Indian context but various studies have shown the percentage of overweight urban people, as high as 45 in females and 30 in males. (15)

The expected urban population of India is 35% by the turn of century, as compared to 16% in 1950. While one third of Indian population still falls below the poverty line, there has been a steady growth of relatively affluent urban middle class estimated to number over 200 million and the number is expected to increase in coming decades (16).

### Aims & Objectives

1. To find out the prevalence of overweight and obesity in adults aged 18 years and above in an urban population of Meerut.
2. To suggest measures for prevention of overweight and obesity in adult population.

### Material & Methods

The study was conducted in urban population equal to or over 18 years of age covered by Urban Health Centre, Surajkund, Meerut which is the Urban Field Practice Area of Department of Social and Preventive

Medicine, Lala Lajpat Rai Memorial Medical College, Meerut. Sample size, at 10% precision and 25% prevalence, was calculated to be 1152. After a pre-test average of four sampling units were found so every fifth family was selected by systematic random sampling from the total of 1698 families registered at Urban Health Centre. During home visits, the members of the house were enlisted. Members not available were contacted later on. The subjects were made comfortable and were told about the purpose of the study and their co-operation was sought. They were interviewed personally using pre-designed and pre-tested questionnaire, and information was collected about socio-demographic characteristics, personal factors, measurements of weight, height, waist and hip circumference of the individual were taken.

The weight was taken on a portable bath room type of weighing machine, which was standardized every day with standard weights. The person was asked to take off footwear and to have minimal clothing. Weight was recorded to the nearest half kilogram.

The height was measured without footwear. The person was asked to stand erect against a wall with his heels touching it and gaze horizontal. Height was measured to the nearest half centimeter on a scale marked on the wall, using a non-stretchable metallic tape. Waist circumference was measured in standing position at the midpoint between lower border of ribcage and anterior supra iliac spine by a measuring tape. It was done in all subjects by only one person to avoid subject bias.

Hip circumference was measured at the widest part of hip by a measuring tape.

The criteria used for recording various factors were as follows:

Body Mass Index (BMI) - As criterion for overweight and obesity.

$BMI = Wt. (kg) / Ht^2 (Mt).$

The classification used is in agreement with the recommended by WHO 17 and is same for both sexes.

Waist Hip Ratio (WHR) As criterion for abdominal obesity

$W.H.R = \text{Waist Circumference} / \text{Hip circumference}$   
Over the past 10 years or so it has become accepted that a high Waist Hip Ratio (WHR > 1.0 in men and > 0.85 in women) indicated abdominal fat accumulation. (18)

## Results

In all 418 persons aged 18 years and above were found to be having BMI 25 and above accounting for a prevalence of overweight and obesity as 36.0% with the prevalence of overweight (BMI - 25-29.99) and obesity (BMI  $\geq$  30) being 28.0% and 8.0% respectively ([Table -1](#)).

About half 51.4% persons were normal while 12.5% persons were under weight. Prevalence of obesity was more in females (10.2%) than males (5.9%) while Prevalence of overweight was more in males (30.2%) than females (25.7%) but overall Prevalence of overweight or obese (BMI  $\geq$  25) was slightly more in males (36.1%) than females (35.9%). This difference of BMI in relation to sex was found to be statistically significant ( $p < 0.001$ ).

[Table - 2](#) shows that the prevalence of abdominal obesity was 25.8%. Abdominal obesity was more in females (29.9%) than males (22.8%), and this difference in prevalence of abdominal obesity among two sexes was found to be statistically significant ( $p < 0.02$ ).

[Table - 3](#) shows that prevalence of overweight and obesity according to Body Mass Index and Waist Hip Ratio was 36.0% and 25.8% respectively and this difference in prevalence of overweight and obesity according to these two criteria was found to be statistically significant ( $p < 0.001$ ).

As shown in [Table - 4](#) about two-third (66.9%) of abdominal obesity rightly corresponded with the high BMI (25+) whereas remaining one-third (33.1%) abdominal obesity was found to be present in persons having either normal (28.8%) or subnormal BMI (4.3%) proving it to be less reliable indicator of overweight and obesity. Figure 1 also shows that the prevalence of abdominal obesity increased with the increasing BMI, being maximum (53.7%) in persons having BMI 30 and above followed by 46.1%, 14.4% and 8.9% in persons having BMI 25-29.99, 18.5-24.99 & < 18.5 respectively. This difference in prevalence of abdominal obesity in relation to BMI was found to be statistically significant ( $p < 0.001$ ).

## Discussion

In the present study, the prevalence of overweight (BMI  $\geq$  25) was 36.0% while only 8.0% were obese (BMI  $\geq$  30). Obesity was found more (10.2%) in females as compared to males (5.9%). Sood *et al* (19) reported that 9.4% males and 19.9% females had relative body weight > 120% (metropolitan standard) in Delhi. Kamath 3 reported 32.8% females had

obesity (>20% excess body weight) in Bombay. Dhurandhar (20) found overweight (BMI  $\geq$  25) in Bombay, lowest (10.7%) in male students and highest (53.1%) in male medical doctors Gopinath *et al*.20 found overweight (BMI  $\geq$  25) in urban Delhi to be 27.8% in adult population Visweswara Rao (21) found obesity (BMI  $\geq$  30) to be 23.9% & 36.3% in urban males and females of high Socioeconomic Strata.

Sood *et al*. (19) found overweight (BMI  $\geq$  25) in Shimla to be 21.5% in adults. Asthana *et al* (22) found prevalence of obesity by (BMI  $\geq$  25) and Skin fold thickness as 30.24% and 49.12% respectively in affluent females of Varanasi. ICMR multi-centric study found obesity (BMI  $\geq$  27) 36.7% and 48.6% in males and females respectively in urban Delhi. Nutrition Foundation of India (23) reported that 29.2% men and 45.6% women of middle class of urban Delhi were overweight (BMI  $\geq$  25). Reddy *et al* (24) found that 35.1% males and 47.6% females were overweight (BMI  $\geq$  25) in adult urban Delhi population. Cheryl D. Fryar, *et al* (25) found the results from the 2011–2012 National Health and Nutrition Examination Survey (NHANES), using measured heights and weights, published in September 2014, indicate that an estimated 33.9% of U.S. adults aged 20 and over are overweight (BMI 25.0–29.9), 35.1% are obese (BMI greater than or equal to 30.0), and 6.4% are extremely obese (BMI greater than or equal to 40.0). Ogden CL *et al* (26) found that more than one-third of adults and 17% of youth in the United States are obese.

In present study, the prevalence of abdominal obesity was 22.8% and 29.9% in males and female respectively which is lower than 56.2% and 51.3% given by Singh *et al* (7), 29.3% and 48.3% given by Nutrition foundation of India (23), in males and females respectively.

## Conclusion

The prevalence of overweight was 36.0% and of obesity was 8.0% in the study population. More females (10.2%) were obese than males (5.9%) but the difference between the prevalence of overweight among males and females was not significant. Abdominal obesity was more (29.9%) in females than males (22.8%). Maximum overweight people (49.2%) were between (50-59) years of age in the population.

## Recommendation

However, public health intervention programs have had limited success in tackling the rising prevalence of obesity.

Maintenance of BMI and waist hip ratio in normal range or preventing the further increase through Dietary factors, physical activity patterns and healthy lifestyles at following different levels of prevention is recommended. (14)

- universal/public health prevention (directed at everyone in a community);
- selective prevention (directed at high-risk individuals and groups);
- targeted prevention (directed at those with existing weight problems and those at high risk of diseases associated with overweight).

Though a lot of persons are successful in losing weight but commonly between a half and one-third of this weight loss is gained again over the next year (27). This again weight gain is independent of the extent of the initial weight loss or the techniques used to assist weight loss. The first year after losing weight is considered to be a difficult period particularly for again weight gain prevention, because biological and behavioral processes act to drive body weight back to baseline levels (28). Despite the difficulty of achieving and maintaining weight loss over long periods, some people succeed in doing so (29). Study of these individuals may provide some clues that will help to explain their success.

## Limitation of the study

Study area was only that area which was covered under RHTC, Lala Lajpat Rai Memorial Medical College, Meerut which may or may not be a representative sample of an urban area of Meerut.

## Relevance of the study

The study gives the prevalence of overweight and obesity in an urban area of western Uttar Pradesh (Meerut) which is comparable to the increase in overweight and obesity in urban areas of the country. It also gives the gender difference of overweight (not significant) obesity (significant) and abdominal obesity of the local urban population.

## Authors Contribution

All authors have contributed equally.

## References

1. Garrow J. S.: Obesity and related diseases. London, Churchill Living stone, 1988: 1–16.

2. Sood A k, Kapil you & Gupta M C : An Epidemiological Study of obesity in an urban community of Malviya nagar, South Delhi. Indian Journal of Nutrition & Diet 1985; 22, 42–48.
3. Kamath S : A Study of energy balance and weight loss among Indian women. Dissertation Diploma in Dietics Bombay. S N D T women's University, 1988.
4. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. BMC Public Health. 2009 Mar 25;9:88. doi: 10.1186/1471-2458-9-88. Review. PubMed PMID: 19320986; PubMed Central PMCID: PMC2667420. [\[PubMed\]](#).
5. Murugan AT, Sharma G. Obesity and respiratory diseases. Chron Respir Dis. 2008;5(4):233-42. doi: 10.1177/1479972308096978. Review. PubMed PMID: 19029235. [\[PubMed\]](#).
6. Schelbert KB. Comorbidities of obesity. Prim Care. 2009 Jun;36(2):271-85. doi: 10.1016/j.pop.2009.01.009. Review. PubMed PMID: 19501243. [\[PubMed\]](#).
7. Ting SM, Nair H, Ching I, Taheri S, Dasgupta I. Overweight, obesity and chronic kidney disease. Nephron Clin Pract. 2009;112(3):c121-7; discussion c127. doi: 10.1159/000214206. Epub 2009 Apr 24. Review. PubMed PMID: 19390212. [\[PubMed\]](#).
8. World Cancer Research Fund and American Institute for Cancer Research. Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective; American Institute for Cancer Research: Washington, DC, USA, 2007.
9. Wearing SC, Hennig EM, Byrne NM, Steele JR, Hills AP. Musculoskeletal disorders associated with obesity: a biomechanical perspective. Obes Rev. 2006 Aug;7(3):239-50. Review. PubMed PMID: 16866972. [\[PubMed\]](#).
10. Christensen R, Bartels EM, Astrup A, Bliddal H. Effect of weight reduction in obese patients diagnosed with knee osteoarthritis: a systematic review and meta-analysis. Ann Rheum Dis. 2007 Apr;66(4):433-9. Epub 2007 Jan 4. Review. PubMed PMID: 17204567; PubMed Central PMCID: PMC1856062. [\[PubMed\]](#)
11. Batty GD, Shipley MJ, Kivimaki M, Barzi F, Smith GD, Mitchell R, Marmot MG, Huxley R. Obesity and overweight in relation to liver disease mortality in men: 38 year follow-up of the original Whitehall study. Int J Obes (Lond). 2008 Nov;32(11):1741-4. doi: 10.1038/ijo.2008.162. Epub 2008 Sep 16. PubMed PMID: 18794897. [\[PubMed\]](#).
12. Tsai, C.J.; Leitzmann, M.F.; Willett, W.C.; Giovannucci, E.L. Prospective study of abdominal adiposity and gallstone disease in US men. Amer. J. Clin. Nutr. 2004, 80, 38-44. Int. J. Environ. Res. Public Health 2010, 7 781
13. Woo J, Leung J, Kwok T. BMI, body composition, and physical functioning in older adults. Obesity (Silver Spring). 2007 Jul;15(7):1886-94. PubMed PMID: 17636108. [\[PubMed\]](#).
14. WHO Technical Report Series 894 Obesity: Preventing and Managing The Global Epidemic. World Health Organization: Geneva, Switzerland, 2000.
15. Nutrition Foundation of India, Obesity in the Urban middle class in Delhi, Scientific Report 15. edited by Krishnaswamy K .
16. Gopalan C. : Obesity in the Indian urban middle class, Bulletin of the Nutrition Foundation of India, 19, 1, 1998.
17. WHO: Physical status : the use and interpretation of anthropometry. Report of a WHO Expert Committee Geneva, World Health Organization, 1995; (TRS-854) : 329.
18. Han TS *et al*. The influences of height and age on waist circumferences as an index of adiposity in adults. International Journal of Obesity and Related Metabolic Disorders, 1997; 21 : 83–89.

19. Sood RK, Gupta AK, Ahluwalia SK, Dhadwal D, Sharma RK. An epidemiological study of obesity in Shimla Town. *Indian J Med Sci*. 1996 Oct;50(10):362-4. Erratum in: *Indian J Med Sci* 1996 Dec;50(12):341. Sood K [corrected to Sood RK];Gupta K [corrected to Gupta AK];Ahluwalia K [corrected to Ahluwalia SK];Sharma K [corrected to Sharma RK]. PubMed PMID: 9057371. [PubMed].

20. Dhurandhar NV, Kulkarni PR. Prevalence of obesity in Bombay. *Int J Obes Relat Metab Disord*. 1992 May;16(5):367-75. PubMed PMID: 1319972. [PubMed].

21. Gopinath N, Chadha SL, Jain P, Shekhawat S, Tandon R. An epidemiological study of obesity in adults in the urban population of Delhi. *J Assoc Physicians India*. 1994 Mar;42(3):212-5. PubMed PMID: 7860511. [PubMed].

22. 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 Apr-Jun;42(2):37-41. PubMed PMID: 10389507. [PubMed].

23. Nutrition Foundation of India, Obesity in the Urban middle class in Delhi, Scientific Report 15. ed by Krishnaswamy K.

24. Reddy KS, Prabhakaran D, Shah P, Shah B. Differences in body mass index and waist: hip ratios in North Indian rural and urban populations. *Obes Rev*. 2002 Aug;3(3):197-202. PubMed PMID: 12164472. [PubMed].

25. Cheryl D. Fryar, *et al* .Division of Health and Nutrition Examination Surveys. September 2014. Prevalence of Overweight, Obesity, and Extreme Obesity Among Adults: United States, 1960–1962 Through 2011–2012. Available from: [https://www.cdc.gov/nchs/data/hestat/obesity\\_adult\\_11\\_12/obesity\\_adult\\_11\\_12.htm](https://www.cdc.gov/nchs/data/hestat/obesity_adult_11_12/obesity_adult_11_12.htm).

26. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA*. 2014 Feb 26; 311(8):806-14. doi: 10.1001/jama.2014.732

27. Wadden TA. Treatment of obesity by moderate and severe caloric restriction. Results of clinical research trials. *Annals of Internal Medicine*, 1993, 119:688-693.

28. Wing RR. Changing diet and exercise behaviors in individuals at risk for weight gain. *Obes Res*. 1995 Sep;3 Suppl 2:277s-282s. Review. PubMed PMID: 8581787. [PubMed].

29. Klem ML, Wing RR, McGuire MT, Seagle HM, Hill JO. A descriptive study of individuals successful at long-term maintenance of substantial weight loss. *Am J Clin Nutr*. 1997 Aug;66(2):239-46. PubMed PMID: 9250100. [PubMed].

30. Chan RS, Woo J. Prevention of overweight and obesity: how effective is the current public health approach. *Int J Environ Res Public Health*. 2010 Mar;7(3):765-83. doi: 10.3390/ijerph7030765. Epub 2010 Feb 26. Review. PubMed PMID: 20617002; PubMed Central PMCID: PMC2872299. [PubMed]

**Tables**

**TABLE 1 DISTRIBUTION OF POPULATION BY BODY MASS INDEX (BMI)**

BMI	Males		Females		Total	
	No.	Prevalence (%)	No.	Prevalence (%)	No.	Prevalence (%)
> 30	35	5.9	58	10.2	93	8.0
25 – 29.99	179	30.2	146	25.7	325	28.0
18.5 – 24.99	320	53.9	277	48.8	597	51.4
< 18.5	59	9.9	86	15.1	145	12.5
<b>Total</b>	<b>593</b>	<b>51.1</b>	<b>567</b>	<b>48.9</b>	<b>1160</b>	<b>100.0</b>

$\chi^2(3) = 16.55$   $P < 0.001$

**TABLE 2 DISTRIBUTION OF POPULATION BY WAIST HIP RATIO (WHR )**

WAIST HIP RATIO	Males		Females		Total	
	No.	Prevalence (%)	No.	Prevalence (%)	No.	Prevalence (%)
High	135	22.8	164	29.9	299	25.8
Normal	458	77.2	403	71.1	861	74.2
<b>Total</b>	<b>593</b>	<b>51.1</b>	<b>567</b>	<b>48.9</b>	<b>1160</b>	<b>100.0</b>

Male Vs Female -  $\chi^2(1) = 5.746$   $p < 0.02$

**TABLE 3 OVERWEIGHT AND OBESITY ACCORDING TO BODY MASS INDEX AND WAIST HIP RATIO**

Criteria	Over Weight and Obesity	
	No.	Prevalence (%)
<b>BODY MASS INDEX (25+)</b>	418	36.0
<b>WAIST HIP RATIO (HIGH)</b>	299	25.8
<b>Total Population</b>	<b>1160</b>	

$\chi^2(1) = 28.58$   $p < 0.001$

**TABLE 4 DISTRIBUTION OF HIGH WHR (ABDOMINAL OBESITY) IN RELATION WITH B.M.I.**

BMI	Population	Total		
		High WHR	%	Prevalence %
> 30	93	50	16.7	53.7
25- 29-99	325	150	50.2	46.1
18.5-24.99	597	86	28.8	14.4
< 18.5	145	13	4.3	8.9
<b>Total</b>	<b>1160</b>	<b>299</b>	<b>100.0</b>	<b>25.8</b>

High WHR Vs BMI  $\chi^2(3) = 170.2$   $p < 0.001$