

## Prevalence of Overweight and Obesity and its Epidemiological Determinant: a Cross-Sectional Study in Bihar Region

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Received: 13-11-2023 / Revised: 16-12-2023 / Accepted: 26-01-2024

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Conflict of interest: Nil

### Abstract

**Aim:** The aim of the present study was to assess the prevalence of obesity and overweight and to find out predictors for obesity.

**Methods:** This cross-sectional study was carried out among adult individuals (aged 18-55 years) in the Department of Community medicine, JNKTMC, Madhepura, Bihar, India from November 2020 to October 2021. All the individuals were residents of the rural and urban areas.

**Results:** Most of the participants were males 200 (66.66%) and 100 (33.34%) were female. Out of total study subject 264 (88%) were resident of urban area and 36 (12%) from rural area. Maximum number of participants was non worker 125 (41.66%). Socioeconomic status assesses most of them from upper class category 170 (56.66%). The age specific prevalence of obesity 55 (18.33%) in 36-55 years and 46 (15.33%) in 18-35 years, however the prevalence of and overweight was 35 (11.66%) in 18-35 years and 20 (6.66%) in 36-55 years. it was found to be statistically significant. Prevalence of obesity and overweight among males was 76 (25.33%) and 47 (15.66%) and among females 28 (9.33%) and 14 (3.33%) respectively. it was found to be statistically significant. The mean weight and height were highly significant among both the sexes. ( $p < 0.001$ ) slightly greater mean of BMI was found among males ( $23.7 \pm 3.14$  kg/m<sup>2</sup>) as compare to females ( $22.8 \pm 3.67$  kg/m<sup>2</sup>). The overall prevalence obesity ( $\geq 25$  kg/m<sup>2</sup>) was 105 (35%) and overweight ( $\geq 23$  kg/m<sup>2</sup>) 58 (16.66%). The prevalence of obesity was observed higher among males 75 (25%) and 30 (10%) female. However, the prevalence of overweight was also higher among the males 40 (13.33%) than female 10 (3.33%).

**Conclusion:** Suitable health care strategy and intervention programs along with health education are needed to reduce the impact. These results suggested that overweight and obesity may be serious public health problems. It is important to carry out further studies in order to explore the potential relationship between overweight and obesity on the one hand, and behavioral variables, such as smoking and alcohol consumption, on the other.

**Keywords:** BMI, Gender, Obesity, Occupation, Overweight, Place of residence, Socioeconomic status

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### Introduction

In 2016, 2 billion adults aged 18 years and above were overweight, of whom 650 million were obese. [1] Hitherto regarded as a public health issue of well-heeled nations, overweight and obesity have also emerged as a problem of concern in developing low-income and middle-income countries (LMICs). [2] The last decade has witnessed a noteworthy change in patterns of disease. This change was initially identified by Omran, and it has come to be known as the epidemiologic transition. [3] Tackling overweight and obesity is in accordance with attaining Sustainable Development Goal number 3 (SDG 3) for "Good Health and Wellbeing."

The World Health Organization (WHO) has prioritized "halting" the rise of obesity by the year 2025 in one of its 9 global voluntary targets to attain

success in the fight against noncommunicable diseases (NCDs). [4] The mounting epidemic in people of all age groups translates into an increasing risk of developing various NCDs, which are responsible for 70% of global mortality. [5] Overweight and obesity are established risk factors for cardiovascular disease (mainly stroke and heart disease), diabetes, musculoskeletal disorders, and many other forms of cancer. Apart from the resultant increased risk of mortality, overweight and obesity push people into poverty globally (especially in LMICs) through associated direct and indirect health care costs. [6] For the past decades, sub-Saharan Africa has been battling against undernutrition and infectious diseases, but in recent years, overweight and obesity and NCDs have put pressure on

healthcare systems in this region. [7] The increase in rates of overweight and obesity has occurred more quickly in developing countries, thus translating into a “double-burden of malnutrition,” as overweight and obesity exist side by side with undernutrition. Because overweight and obesity are established risk factors for NCDs, there has also been a “double burden” of persisting infectious diseases and emerging NCDs. [8]

Numerous recommendations have been made for global surveillance of modifiable proximal determinants of overweight and obesity, but less attention has been paid to social factors, which in public health are equally important in the holistic understanding of various determinants of health.<sup>9</sup> As health is a social construct, the WHO’s Commission on Social Determinants of Health has set up a comprehensive framework for understanding the different social factors that are associated with health. The framework brings together different aspects of social productivity in health and looks at social context, social stratification, differential exposure and vulnerabilities, and the consequences of ill health.<sup>10</sup> In this framework, behavior, biological, psychosocial factors, and other factors are regarded as social-cohesion factors. In research, although certain behaviors are studied as “lifestyle” factors, the social aspect of this framework stipulates that such factors and even biological factors (such as parity) are embedded within it.

The aim of the present study was to assess the prevalence of obesity and overweight and to find out predictors for obesity.

### Materials and Methods

This cross-sectional study was carried out among adult individuals (aged 18-55 years) in the Department of Community medicine, JNKTMCH,

Madhepura, Bihar, India from November 2020 to October 2021. All the individuals were residents of the rural and urban areas.

All ages 20-55 years were included in the study verbal and written consent was taken from the respondent before collecting the information. The questionnaire schedule was included information about A) identification data: family information, socioeconomic condition. B) Information regarding individual person, their lifestyle. The interview was conducted in local language Marathi. The care was taken to ensure privacy and confidentiality of interview as a part of study objective of the study was explained to the respondents.

All anthropometric measurement was taken using WHO steps guidelines.<sup>5</sup> BMI: The BMI was calculated using the following formula: BMI (kg/m<sup>2</sup>) = weight (kg)/ height (m<sup>2</sup>). The WHO had proposed a redefined criterion for overweight and obesity among Asian populations and this was used to evaluate the prevalence of overweight and obesity in the present study. The BMI cut-off points utilized for the assessment of overweight and obesity were  $\geq 23.00$  kg/m<sup>2</sup> and  $\geq 25.00$  kg/m<sup>2</sup> respectively. For combined overweight-obesity, the cut-off point was  $\geq 23.00$  kg/m<sup>2</sup>.

The data was entered in Microsoft Excel (2019 version) and analysis was done Jamovi software (2.3.26 version). Descriptive statistics like percentages, mean and standard deviation were found and in inferential statistics Chi- square test was used to find the significance. P value of <0.05 was observed as statistically significant.

### Results

**Table 1: Characteristics of study population**

Variables	Males, n=200; N (%)	Females, n=100; N (%)	Total, n=300; N (%)	$\chi^2$ p value
<b>Age group (years)</b>				
18-35	106 (53)	65 (65)	171 (57)	0.198
36-55	94 (47)	35 (35)	129 (43)	
<b>Area of residence</b>				
Rural	30 (15)	6 (6)	36 (12)	0.022
Urban	170 (85)	94 (94)	264(88)	
<b>Marital status</b>				
Married	120 (60)	75 (75)	195 (65)	0.184
Unmarried	70 (35)	20 (20)	90 (30)	
Widowed	6 (3)	5 (5)	11 (3.66)	
Separated	4 (2)	0 (0)	4 (1.34)	
<b>Education</b>				
Illiterate	8 (4)	10 (10)	18 (6)	0.172
Primary	60 (30)	40 (40)	100 (33.34)	
Secondary	50 (25)	10 (10)	60 (20)	
Higher Secondary	40 (20)	15 (15)	55 (18.34)	
Graduate	30 (15)	20 (10)	50 (16.66)	

Post graduate	12 (6)	5 (5)	17 (5.66)	
<b>Occupation</b>				
Non-worker	50 (25)	75 (75)	125 (41.66)	
Labourer	20 (10)	5 (5)	25 (8.33)	
Farmer	24 (12)	5 (5)	29 (9.66)	<0.001
Skilled worker	10 (5)	0 (0)	10 (3.34)	
Service Government	50 (25)	10 (10)	60 (20)	
Service Private	46 (23)	5 (5)	51 (17)	
<b>Socio-economic status</b>				
Upper class	120 (60)	50 (50)	170 (56.66)	0.540
Upper middle	50 (25)	35 (35)	85 (28.34)	
Middle class	15 (7.5)	8 (8)	23 (7.66)	
Lower middle	10 (5)	4 (4)	14 (4.66)	
Lower class	5 (2.5)	3 (3)	8 (2.66)	

Most of the participants were males 200 (66.66%) and 100 (33.34%) were female. Out of total study subject 264 (88%) were resident of urban area and 36 (12%) from rural area. Most of participants were married 195 (65%) followed unmarried 90 (30%)

the separated participant was very less in number 4 (1.34%). Maximum number of participants was non worker 125 (41.66%). Socioeconomic status assesses most of them from upper class category 170 (56.66%).

**Table 2: Association BMI with Socio-demographic information**

Variables	No of individual (N = 300)	BMI				p value
		Underweight (<18.5 kg/m <sup>2</sup> )	Normal (18.5-22.9 kg/m <sup>2</sup> )	Overweight (23-24.9 kg/m <sup>2</sup> )	Obese (≥25 kg/m <sup>2</sup> )	
Age (in years)	18-35	20	70	35	46	
	36-55	5	49	20	55	0.01
Area	Rural	5	17	8	6	
	Urban	20	100	45	99	0.1
Sex	Female	10	48	10	28	
	Male	14	67	47	76	0.0
MaritalStatus	Married	14	74	34	73	
	Unmarried	10	35	20	25	0.48
	Widowed	0	5	1	5	
	Separated	2	2	0	4	
Education	Illiterate	3	4	2	5	
	Primary	6	16	6	15	
	Secondary	12	45	10	18	0.5
	Higher secondary	8	25	10	17	
	Graduate	5	22	10	18	
Post graduate	0	5	6	6		
Occupation	Non-worker	15	55	19	36	
	Labourer	2	8	5	10	
	Farmer	4	10	7	8	0.1
	Skilled worker	2	4	1	3	
	Service government	3	21	17	19	
	Service private	2	20	10	27	
	Upper class	7	60	40	63	
Socio-economic status	Upper middle	9	38	13	25	0.03
	Middle class	5	10	3	5	
	Lower middle	2	8	1	3	
	Lower class	3	2	2	1	

The age specific prevalence of obesity 55 (18.33%) in 36-55 years and 46 (15.33%) in 18-35 years, however the prevalence of and overweight was 35 (11.66%) in 18-35 years and 20 (6.66%) in 36-55 years. it was found to be statistically significant.

Prevalence of obesity and overweight among males was 76 (25.33%) and 47 (15.66%) and among females 28 (9.33%) and 14 (3.33%) respectively. it was found to be statistically significant.

**Table 3: Sex specific descriptive statistics (mean± standard deviation) of the anthropometric variables**

Variables	Male (n =200)	Female (n=100)	Sex difference (p value)
Weight (kg)	62.8±8.82	55.5±9.91	0.001
Height (m)	1.64±0.06	1.52±0.04	0.001
BMI (kg/m <sup>2</sup> )	23.7±3.14	22.8±3.67	0.001

The mean weight and height were highly significant among both the sexes. (p<0.001) slightly greater mean of BMI was found among males (23.7±3.14 kg/m<sup>2</sup>) as compare to females (22.8±3.67 kg/m<sup>2</sup>).

**Table 4: Prevalence of overweight and obesity among the study population**

Excess of adiposity	Male (n =200)	Female (n=100)	Total (n=300)	Sex difference (p value)
Overweight (BMI=23.00-24.99 kg/ m <sup>2</sup> )	40	10	50	0.020
Obese (BMI≥25 kg/ m <sup>2</sup> )	75	30	105	0.022
Combine overweight (BMI≥23 kg/ m <sup>2</sup> )	115	40	155	0.014

The overall prevalence obesity (≥25 kg/m<sup>2</sup>) was 105 (35%) and overweight (≥23 kg/m<sup>2</sup>) 58 (16.66%). The prevalence of obesity was observed higher among males 75 (25%) and 30 (10%) female. However, the prevalence of overweight was also higher among the males 40 (13.33%) than female 10 (3.33%).

### Discussion

Epidemiological studies have empirically demonstrated that obesity is a risk factor for a range of chronic diseases, including cardiovascular diseases, diabetes, chronic kidney disease, certain types of cancers and musculoskeletal disorders. Youth- Asians in particular are at increased risk of cardiometabolic diseases at a lower body mass index (BMI) and younger age relative to Caucasians. [11] Body mass index is promulgated by WHO as the most useful tool to measure the obesity. It is nevertheless a crude index that does not take in to account the distribution of body fat, resulting in variability in different individual and population. [12] Indian also tends to have excess of body fat, abdominal fat and truncal obesity for any given waist and any given fat have increases insulin resistance. This feature has been referred as "Asian Indian Phenotype". [13]

Most of the participants were males 200 (66.66%) and 100 (33.34%) were female. Out of total study subject 264 (88%) were resident of urban area and 36 (12%) from rural area. Most of participants were married 195 (65%) followed unmarried 90 (30%) the separated participant was very less in number 4 (1.34%). Maximum number of participants was non worker 125 (41.66%). Socioeconomic status assesses most of them from upper class category 170 (56.66%). The age specific prevalence of obesity 55

(18.33%) in 36-55 years and 46 (15.33%) in 18-35 years, however the prevalence of and overweight was 35 (11.66%) in 18-35 years and 20 (6.66%) in 36-55 years. it was found to be statistically significant. Fitness is closely intertwined with obesity, and has powerful influences on health and mortality. Data from the Aerobics Center Longitudinal Study show that low cardiovascular fitness accounted for all of the excess all-cause mortality among obese men. [14] Similar data by these researchers have been reported for women. [15] In short, it seems probable that body weight, like height or baldness, is for the most part a proxy for many unmeasured variables. From a public health perspective, the most significant aspect of such a conclusion is that most of these unmeasured variables, especially the lifestyle factors, are more readily modifiable than body mass.

Prevalence of obesity and overweight among males was 76 (25.33%) and 47 (15.66%) and among females 28 (9.33%) and 14 (3.33%) respectively. it was found to be statistically significant. The mean weight and height were highly significant among both the sexes. (p<0.001) slightly greater mean of BMI was found among males (23.7±3.14 kg/m<sup>2</sup>) as compare to females (22.8±3.67 kg/m<sup>2</sup>). The study conducted by Rai et al [11] conducted study in West Bengal India in (2017) reported 10.1% men and 14.6% women overweight. Venkatrao et al reported that in 2020 obesity was higher among women than men 41% versus 36.67% our study shows almost similar finding with the above study.<sup>16</sup> The overall prevalence obesity (≥25 kg/m<sup>2</sup>) was 105 (35%) and overweight (≥23 kg/m<sup>2</sup>) 58 (16.66%). The prevalence of obesity was observed higher among males 75 (25%) and 30 (10%) female. However, the prevalence of overweight was also higher among the

males 40 (13.33%) than female 10 (3.33%). The study conducted by Vedera et al [17] in Jamnagar Gujrat in 2010 was reported 5.20% and 22.4% prevalence of obesity and overweight. The study carried out by Jain et al [18] in 2018 in Urban area of Meerut and reported that the prevalence of obesity and overweight 6.9% and 17.4% among adolescent. The other study's reported that the prevalence of overweight and obesity were significantly higher in middle age individual and belonging to higher socioeconomic status and those living in urban society group lower than  $p < 0.05$ . [19-21] Our study finding was almost similar to above study finding.

### Conclusion

Suitable health care strategy and intervention programs along with health education are needed to reduce the impact. These results suggested that overweight and obesity may be serious public health problems. It is important to carry out further studies in order to explore the potential relationship between overweight and obesity on the one hand, and behavioral variables, such as smoking and alcohol consumption, on the other.

### References

- World Health Organization. Overweight and obesity; 2018
- Barakat-Haddad C, Saeed U, Elliott S. A longitudinal cohort study examining determinants of overweight and obesity in adulthood. *Can J Public Health*. 2017 Apr 20; 108(1):e27-e35.
- Omran AR. The epidemiologic transition. A theory of the epidemiology of population change. *Milbank Mem Fund Q*. 1971 Oct;49 (4):509-38.
- Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. *Nutr Rev*. 2012 Jan;70(1):3-21.
- World Health Organization. Global status report on non-communicable diseases 2014; 2015.
- Dee A, Kearns K, O'Neill C, Sharp L, Staines A, O'Dwyer V, Fitzgerald S, Perry IJ. The direct and indirect costs of both overweight and obesity: a systematic review. *BMC Res Notes*. 2014 Apr 16;7:242.
- Agyemang C, Boatema S, Frempong GA, Aikins A. Obesity in sub-Saharan Africa. In: Ahima RS, ed. *Metabolic syndrome*. Switzerland: Springer International Publishing; 2016. p 1-13.
- Steyn NP, Nel JH, Parker WA, Ayah R, Mbithe D. Dietary, social, and environmental determinants of obesity in Kenyan women. *Scand J Public Health*. 2011 Feb;39(1):88-97.
- Micklesfield LK, Lambert EV, Hume DJ, Chantler S, Pienaar PR, Dickie K, Puoane T, Goedecke JH. Socio-cultural, environmental and behavioural determinants of obesity in black South African women. *Cardiovasc J Afr*. 2013 Oct-Nov;24(9-10):369-75.
- World Health Organization. A conceptual framework for action on the social determinants of health: debates, policy & practice, case studies; 2010.
- Rai RK, Jaacks LM, Bromage S, Barik A, Fawzi WW, Chowdhury A. Prospective cohort study of overweight and obesity among rural Indian adults: sociodemographic predictors of prevalence, incidence and remission. *BMJ Open*. 2018;8(8):e021363.
- Deshmukh PR, Gupta SS, Dongre AR, Bharambe MS, Maliye C, Kaur S, et al. Relationship of anthropometric indicators with blood pressure levels in rural Wardha. *Indian J Med Res*. 2006;123(5):657.
- Mohan V, Deepa R. Obesity and abdominal obesity in Asian Indian. *Indian J Med Res*. 2006;123:539-96.
- Lee CD, Blair SN, Jackson AS. Cardiorespiratory fitness, body composition, and all-cause and cardiovascular disease mortality in men. *The American journal of clinical nutrition*. 1999 Mar 1;69(3):373-80.
- Farrell SW, Braun L, Barlow CE, Cheng YJ, Blair SN. The relation of body mass index, cardiorespiratory fitness, and all-cause mortality in women. *Obesity Research*. 2002 Jun;10(6):417-23.
- Venkatrao M, Nagarathna R, Majumdar V, Patil SS, Rathi S, Nagendra H. Prevalence of obesity in India and its neurological implications: a multifactor analysis of a nationwide cross-sectional study. *Ann Neurosci*. 2020;27(3-4):153-61
- Vadera BN, Yadav SB, Yadav BS, Parmar DV, Unadkat SV. Study on obesity and Influence of dietary factors on the weight status of an adult population in Jamnagar city of Gujarat: a cross-sectional analytical study. *Indian J Community Med*. 2010;35(4):482-6.
- Jain B, Jain S, Chopra H, Garg SK, Singh G, Mittal C. Impact of Sociodemographic factors on prevalence of overweight and obesity among adolescents of urban Meerut. *Indian J Community Health*. 2018;30(1):90-5.
- Kapoor SK, Anand K. Nutritional transition: a public health challenge in developing countries. *Journal of Epidemiology & Community Health*. 2002 Nov 1;56(11):804-5.
- Subramanian SV, Kawachi I, Smith GD. Income inequality and the double burden of under- and overnutrition in India. *Journal of Epidemiology & Community Health*. 2007 Sep 1;61(9):802-9.
- 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).