

Epidemiology of obesity and its related morbidities among rural population attending a primary health centre of Odisha, India

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ABSTRACT

Context: Overweight and obesity has become a major contributor to global burden of chronic diseases and disability. Obesity among rural India is emerging as a major health problem because of change in lifestyle and food habits, thereby increases the risk of multiple morbid conditions among rural population. **Aims:** This study aims to find out the association of overweight/obesity with different socio-demographic factors and explore the co-morbidities among overweight and obese in a rural setting. **Settings and Design:** A cross-sectional study was done in a randomly selected primary health centre of Khurda district, Odisha for 4 months. **Materials and Methods:** This study was done among 183 patients aged >20 years with BMI >25 kg/m² after taking their consent. Anthropometric measurements were done and data were collected using a semi-structured questionnaire. **Statistical Analysis Used:** Descriptive statistics such as proportion, mean and standard deviation were calculated and inferential statistics such as Chi-square test, univariate and multivariate regression was done using the SPSS version 20.0. **Results:** Mean age of participants was 45.7 (±13.8) years. About 93.4% were Grade II obese while 51.9% were at risk according to their waist-hip ratio. Around 53.6% of participants had multi-morbidity. Age, occupation and number of children were significantly associated with obesity. Morbidity was significantly associated with age, occupation, marital status and number of children. Increased grade in obesity the more is the probability of having morbidity. **Conclusions:** There is an urgent need to screen for obesity at rural health facility and early management for prevention from co-morbidities.

Keywords: Body mass index, India, morbidity, obesity, Odisha

Introduction

Obesity has reached epidemic proportions and is a major contributor to the global burden of chronic diseases and disability.^[1] Obese people are at risk of a number of medical conditions that can lead to their further morbidity and mortality.^[2-4] In India, the prevalence of overweight and obesity has increased over the past decade.^[5] This study shows obesity is emerging as a health problem among the rural Indian people because of their change in lifestyle and food habit.^[6]

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There is paucity of obesity-related studies among the rural population of India. This facility-based study was an effort to understand the association of socio-demographic factors with overweight and obesity among rural people and to elicit their morbidity status, information of which could guide the primary care physicians in managing obesity cases.

Materials and Methods

A cross-sectional study among patients visiting to a randomly selected rural primary health centre of Khurda district, Odisha, India was done for a period of 4 months from June to September

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2015. Patients aged >20 years were screened for overweight or obesity by estimating their body mass index. Patients with BMI ≥ 25 kg/m² were included in the study. Among the eligible screened individuals, interested patients who gave their consent were included as study participants. Further assessment about their central obesity was done by estimating waist-hip ratio (WHR). Anthropometric measurements and assessments were done as per the World Health Organisation (WHO) guideline. WHR of >0.95 for male and >0.8 for female was considered cut-off. The physical activity of the participants was assessed using the WHO recommendation and they were categorised as yes or no accordingly.^[7]

Study participants

OPD patients aged >20 years and not seriously ill were considered for screening their BMI status. Those with BMI ≥ 25 kg/m² were explained about the purpose and procedure of study and were asked to participate. Those who agreed and gave consent were included as study participants.

Sample size

Assuming prevalence of overweight/obesity as 10% in a rural setting,^[5] the sample size estimated to be 138, considering a confidence limit of 5% and population size of 30,000 under a primary health centre. Assuming a non-response rate of 20%, the sample size considered for this study was 173, however, data were collected from 183 eligible study participants.

Data collection

During the study, anthropometric measurements like height, weight, BMI and WHR were recorded from all the participants. The participants were interviewed and information about their socio-demographic characteristics and morbidity status was collected. The data collected during the study were entered into Microsoft excel worksheet. Data were validated and cleaned followed by its transfer to the SPSS (version 20) for analysis.

Study tool

Data were collected by the trained medical doctor using a predesigned and pretested semi-structured questionnaire. The information captured belong to three main domains; 1. Socio-demographic profile of the participants including personal habits, 2. Anthropometric measurements of the individual participant and 3. Associated morbidity status.

Data analysis

For categorical variables, we calculated the frequency and proportion and estimated the mean \pm SD for continuous variables [Table 1]. Chi-square test was used to check the association between different variables. Multiple logistic regression was used to determine the significant predictors associated with the multi-morbidity. Statistical analysis was done using the SPSS software version 20.0 and *P* value of <0.05 was considered as significant.

Table 1: Descriptive analysis of continuous variables (n=183)

Variables	Minimum	Maximum	Mean	Std. deviation
Age	20	80	45.70	13.78
BMI	25	43	32.11	2.49
BMI (female)	25.00	43.00	32.68	3.09
BMI (male)	25.82	38.50	31.81	2.06
Systolic BP	110	220	140.48	20.13
Diastolic BP	68	130	89.49	12.06
WHR	0.87	1.13	0.97	0.05
WHR (female)	0.87	1.08	0.96	0.04
WHR (male)	0.92	1.13	0.98	0.05

BMI: Body mass index, WHR: Waist-hip ratio, BP: Blood pressure

Ethical consideration

The study was approved by the Institutional Ethics Committee at the Indian Institute of Public Health, Bhubaneswar. Privacy, confidentiality and anonymity of the participants were ensured during their anthropometric measurements and data collection. The participation was voluntary with freedom to withdraw from the study at any point of time.

Results

Among 198 eligible OPD patients approached, 183 patients participated as study subjects (7.5% non-response). The mean age among the study participants was 45.7 (± 13.8) years. About 38% of participants were in the age group of 20–39 years, while 47% were between 40–59 years and 14.7% were >60 years of age. The male-to-female ratio among the participants was 2:1 (65% male and 35% females). Majority of the study participants were doing jobs (35.5%) followed by housewives (35%) and 25.7% were doing business. In our sample, 74% had educational qualification of class 10th followed by 12% graduation and above, and 10% intermediate. However, only 4% of the total sample had minimal educational qualification (less than 10th or no formal education). Only 8.7% of participants were unmarried while rest were either married/divorced/widowed. Similarly, only 18 (9.8%) participants (15 unmarried +3 recently married) had no children, while 54.1% were having children up to 2 and 36.1% had >2 children. On categorising the participants according to the WHO BMI classification, we found majority (83.6%) were of Grade I obese (BMI = 30–34.9), 9.8% were Grade II obese (BMI = 35–39.9) and only two cases (1.1%) were Grade III/morbid obese (BMI ≥ 40), while 5.5% were overweight (BMI 25–29.9). According to the WHR, 51.9% of the participants were found to be central obese. Among all the study participants, 28.4% were chewing tobacco, 3.8% were smokers, 4.9% were taking alcohol, while 57.4% were not using any of these substances.

In our study, about 24% had no other chronic illness, whereas 44.5% had gastrointestinal-related problems, 48.9% were hypertensive, 32.7% were suffering from osteoarthritis, 18% had diabetes mellitus (DM) of which 14.1% had both diabetes and hypertension. We found 46.4% of subjects with no or

maximum one morbidity, whereas 53.6% had multi-morbidity (more than two).

Age, occupation and number of children were significantly associated with obesity [Table 2]. Univariate data analysis shows presence of morbidity conditions (other than obesity) was significantly associated with age ($P = 0.000$), occupation ($P = 0.050$), marital status ($P = 0.000$) and number of children ($P = 0.000$); however no significant association was observed with gender, education, physical activity and substance abuse habits. People of greater age, those doing business or job and those who are married were significantly more at risk of having multi-morbidity. Increased grade of obesity is significantly associated with more morbid conditions [Table 3]. The multiple logistic regression analysis of the predictors for morbidity shows socio-demographic factors, i.e., age and marital status are significantly associated with morbidity [Table 4]. The odds of multi-morbidity were higher among greater age group (≥ 60 years) than those of 20–39 years age group [odds ratio (OR) = 4.96]. Unmarried people have lesser risk of multi-morbidity than married people (OR = 0.02).

Discussion

Considering the rising problem of overweight, obesity in the rural area and dearth of research studies especially in the eastern part of India, this study tries to explore the socio-demographic characteristics and associated morbidity among overweight and obese patients visiting OPD of a rural primary health facility.

The mean age of participants in our study was 45.7 years with majority (47%) in the age group of 40–59 years, which resembles to other study finding.^[7] Two-third of our study participants were male, which contradicts to the findings that obesity is mainly a problem among women from community-based studies.^[8,9] The reason for this mismatch could be because our study is hospital-based and done among overweight and obese patients visiting to a rural primary centre. In rural part of eastern India, women rarely visit the hospitals unless they have some major health problem. About 96% of our study participants had educational status of 10th standard or more. Though the prevalence of obesity and overweight was more among people with higher educational status, this association was not found to be statistically significant. Research studies have found the proportional relationship between educational status and BMI;^[9,10] while Saji *et al.* have observed prevalence of overweight and obesity to be more among the illiterates.^[11]

We found that increased age and people doing business or job are more likely to be overweight and obese, which matches with findings from other Indian studies.^[5,10,12] In the present study, no significant association of obesity was found with gender, education, physical activity and personal habits. While different studies have found female gender,^[10] high educational status,^[13] physical inactivity^[10] and intake of alcohol^[14] are risk factors for overweight and obesity, while no such association is observed between substance abuse and obesity.^[15] About 51.9% of our study participants were central obese according to their WHR,

Table 2: Socio-demographic distribution across the BMI group

Variables	Category	Over weight n (%)	Grade-I n (%)	Grade-II n (%)	Grade-III n (%)	Total n (%)	Chi-square	P
Age group	20-39	3 (30.0)	59 (38.6)	9 (50.0)	0 (0.0)	71 (38.8)	15.22	0.019
	40-59	4 (40.0)	73 (47.7)	8 (44.4)	0 (0.0)	85 (46.4)		
	≥ 60	3 (30.0)	21 (13.7)	1 (5.6)	2 (100.0)	27 (14.8)		
Sex	Female	2 (20.0)	52 (34.0)	8 (44.4)	2 (100.0)	64 (35.0)	5.48	0.140
	Male	8 (80.0)	101 (66.0)	10 (55.6)	0 (0.0)	119 (65.0)		
Education	Less than 10 th	0 (0.0)	7 (4.6)	0 (0.0)	0 (0.0)	7 (3.8)	6.19	0.720
	10 th and Urdu	10 (100.0)	109 (71.2)	15 (83.3)	2 (100.0)	136 (74.3)		
	Intermediate	0 (0.0)	17 (11.1)	1 (5.6)	0 (0.0)	18 (9.8)		
	Graduation and PG	0 (0.0)	20 (13.1)	2 (11.1)	0 (0.0)	22 (12.0)		
Occupation	Unemployed	2 (20.0)	53 (34.6)	8 (44.4)	2 (100.0)	65 (35.5)	19.26	0.023
	Business/farmer	5 (50.0)	46 (30.1)	2 (11.1)	0 (0.0)	53 (29.0)		
	Semi-skilled worker	3 (30.0)	15 (9.8)	0 (0.0)	0 (0.0)	18 (9.8)		
	Service/ex-service	0 (0.0)	39 (25.5)	8 (44.4)	0 (0.0)	47 (25.7)		
Marital status	Married	10 (100.0)	139 (90.8)	17 (94.4)	2 (100.0)	168 (91.8)	1.42	0.700
	Unmarried	0 (0.0)	14 (9.2)	1 (5.6)	0 (0.0)	15 (8.2)		
No. of children	No child	0 (0.0)	15 (9.8)	3 (16.7)	0 (0.0)	18 (9.8)	27.10	0.001
	≤ 2	7 (70.0)	81 (52.9)	10 (55.6)	0 (0.0)	98 (53.6)		
	3-4	3 (30.0)	44 (28.8)	5 (27.8)	0 (0.0)	52 (28.4)		
Physical activity	>4	0 (0.0)	13 (8.5)	0 (0.0)	2 (100.0)	15 (8.2)	2.00	0.572
	No	6 (60.0)	116 (75.8)	14 (77.8)	2 (100.0)	138 (75.4)		
Substance abuse	Yes	4 (40.0)	37 (24.2)	4 (22.2)	0 (0.0)	45 (24.6)	18.26	0.108
	Nothing	4 (40.0)	90 (58.8)	9 (50.0)	2 (100.0)	105 (57.4)		
	Chewing	2 (20.0)	42 (27.5)	8 (44.4)	0 (0.0)	52 (28.4)		
	Alcohol	0 (0.0)	9 (5.9)	0 (0.0)	0 (0.0)	9 (4.9)		
	Smoking	2 (20.0)	4 (2.6)	1 (5.6)	0 (0.0)	7 (3.8)		
All		2 (20.0)	8 (5.2)	0 (0.0)	0 (0.0)	10 (5.5)		

Table 3: Univariate analysis of morbidity with socio-demographic factors

Variables	Category	No or one morbidity n (%)	Multi-morbidity n (%)	Total n (%)	Chi-square	P
Age group	20-39	47 (55.3)	24 (24.5)	71 (38.8)	23.42	0.000
	40-59	34 (40.0)	51 (52.0)	85 (46.4)		
	≥60	4 (4.7)	23 (23.5)	27 (14.8)		
Sex	Female	34 (40.0)	30 (30.6)	64 (35.0)	1.76	0.215
	Male	51 (60.0)	68 (69.4)	119 (65.0)		
Education	Less than 10 th	1 (1.2)	6 (6.1)	7 (3.8)	4.76	0.190
	10 th and Urdu	64 (75.3)	72 (73.5)	136 (74.4)		
	Intermediate	11 (12.9)	7 (7.1)	18 (9.8)		
	Graduation and PG	9 (10.6)	13 (13.3)	22 (12.0)		
Occupation	Unemployed	35 (41.2)	30 (30.6)	65 (35.5)	7.37	0.050
	Business/farmer	21 (24.7)	32 (32.7)	53 (29.0)		
	Semi-skilled worker	12 (14.1)	6 (6.1)	18 (9.8)		
	Service/ex-service	17 (20.0)	30 (30.6)	47 (25.7)		
Marital status	Married	71 (83.5)	97 (99.0)	168 (91.8)	14.44	0.000
	Unmarried	14 (16.5)	1 (1.0)	15 (8.2)		
No. of children	No child	15 (17.6)	3 (3.4)	18 (9.8)	19.00	0.000
	≤2	49 (57.6)	49 (50.0)	98 (53.6)		
	3-4	19 (22.4)	33 (33.7)	52 (28.4)		
	>4	2 (2.4)	13 (13.3)	15 (8.2)		
Physical activity	No	62 (72.9)	76 (77.6)	138 (75.4)	0.52	0.495
	Yes	23 (27.1)	22 (22.4)	45 (24.6)		
Substance abuse	Nothing	50 (58.8)	55 (56.1)	105 (57.4)	2.4	0.663
	Chewing	25 (29.4)	27 (27.6)	52 (28.4)		
	Alcohol	5 (5.9)	4 (4.1)	9 (4.9)		
	Smoking	2 (2.4)	5 (5.1)	7 (3.8)		
	All	3 (3.5)	7 (7.1)	10 (5.5)		

making them at risk for chronic conditions such as DM and cardiovascular disease (CVD) because of their central obesity.^[16,17]

Univariate analysis of our study shows that increased age, business/service persons, married people and individuals with more number of children are significantly likely to have multi-morbidity ($P < 0.05$). Other studies on obesity also suggest increased age,^[14] married people,^[18] service holders^[19,20] and having more children^[21] increases the risk for obesity and its related complications. However, no significant association of obesity with occupation was found in other study.^[22] This study shows increased grade of obesity is associated with increase in morbidity. Various studies have similarly associated multiple morbidity conditions with overweight and obesity.^[3,23-26] Our study finds hypertension as most common associated morbid condition (48.9%), followed by acid peptic disease (44.5%), osteoarthritis (32.7%) and DM (18%). Other studies also suggest higher BMI to be associated with hypertension,^[9,10] diabetes,^[9] many gastrointestinal diseases^[3] and osteoarthritis.^[25] We observed that 53.6% of our participants had multi-morbidity (two or more morbidities), which is similar to the observation from other study.^[27] Such high prevalence of multi-morbidity could be because of confounders like age, low education and others. Many research studies have attributed obesity to increase the risk of CVD,^[25] stroke,^[28] cancer,^[12] asthma^[4] and worsens chronic obstructive pulmonary disease (COPD)-related outcomes,^[29] though we did not find any association of obesity with cancer and respiratory illness in our study.

The multiple logistic regression analysis for multi-morbidity shows, compared to age group of 20–39 years, the 40–59 years group has OR of 2.16 (0.96–4.86) and group >60 years has OR of 4.96 (1.13–21.92). Compared to people with educational status below 10th standard, those having 10th or higher education have OR 0.18 (0.01–2.79). Compared to unemployed, the people doing business have OR 5.27 (0.48–57.54) and those doing service have OR 5.48 (0.46–65.64) for multi-morbidity. Risk of multi-morbidity is less among unmarried than ever married people with OR 0.02 (0.00–0.70). Because only 15 participants were unmarried, so this finding needs further examination through large research studies.

Conclusion

Socio-demographic factors such as increasing age, married people, people doing business or service are more likely to become overweight or obese. As the obesity status of an individual increases, he/she is more likely to have more morbid conditions. Considering overweight and obesity as a growing health problem among rural population, there is an urgent need to make necessary health facility readiness to screen and identify these cases at the earliest and manage them appropriately to prevent from further morbidities. It is important for the primary care physicians to ensure facility readiness and screening of all suspected cases of overweight/obesity and assess their morbidity status. Early case detection and prompt management will prevent further complications among these cases. There is also a need to make

Table 4: Multiple logistic regression for factors associated with multi-morbidity

Variables	Category	Multi-morbidity n (%)	Total n (%)	Odds ratio (95% CI)
Age group	20-39	24 (24.5)	71 (38.8)	1.00
	40-59	51 (52.0)	85 (46.4)	2.16 (0.96-4.86)
	≥60	23 (23.5)	27 (14.8)	4.96 (1.13-21.92)
Sex	Female	30 (30.6)	64 (35.0)	1.00
	Male	68 (69.4)	119 (65.0)	0.30 (0.03-3.08)
Education	Less than 10 th	6 (6.1)	7 (3.8)	1.00
	10 th and Urdu	72 (73.5)	136 (74.3)	0.18 (0.01-2.79)
	Intermediate	7 (7.1)	18 (9.8)	0.14 (0.01-2.61)
	Graduation and PG	13 (13.3)	22 (12.0)	0.29 (0.02-5.27)
Occupation	Unemployed	30 (30.6)	65 (35.5)	1.00
	Business/farmer	32 (32.7)	53 (29.0)	5.27 (0.48-57.54)
	Semi-skilled worker	6 (6.1)	18 (9.8)	2.13 (0.16-28.90)
	Service/ex-service	30 (30.6)	47 (25.7)	5.48 (0.46-65.64)
Marital status	Married	97 (99.0)	168 (91.8)	1.00
	Unmarried	1 (1.0)	15 (8.2)	0.02 (0.00-0.70)
No. of children	No child	3 (3.4)	18 (9.8)	1.00
	≤2	49 (50.0)	98 (53.6)	0.21 (0.02-2.77)
	3-4	33 (33.7)	52 (28.4)	0.25 (0.02-3.39)
	>4	13 (13.3)	15 (8.2)	0.65 (0.03-13.62)
Physical activity	No	76 (77.6)	138 (75.4)	1.00
	Yes	22 (22.4)	45 (24.6)	0.7 (0.30-1.66)
Substance abuse	Nothing	55 (56.1)	105 (57.4)	1.00
	Chewing	27 (27.6)	52 (28.4)	0.73 (0.31-1.71)
	Alcohol	4 (4.1)	9 (4.9)	0.69 (0.13-3.67)
	Smoking	5 (5.1)	7 (3.8)	1.99 (0.31-12.90)
	All	7 (7.1)	10 (5.5)	2.74 (0.56-13.46)

the rural community aware about the hazards of being obese or overweight. For screening obesity, BMI is a better parameter than WHR because of its high sensitivity,^[11] in spite of the fact that WHR is a better predictor for CVD, diabetes and other metabolic problems.^[17] National programs for the prevention and treatment of overweight, obesity and related co-morbidities and mortalities should be a public health priority.^[1] Though this study explores some important dimensions of research work in the domain of obesity, the small sample size and study setting of only one rural primary health facility, limits its findings for cautious interpretation. Because this study is done among people of >20 years, these finding may not be applicable for childhood obesity. The findings from this study warrants for a large study on obesity in rural settings for better and in-depth understanding of this important problem especially in the eastern part of India.

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Conflicts of interest

There are no conflicts of interest.

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