

Prevalence of Obesity and its Co-Morbidities: A Study Among Thattankuttai Population of Namakkal District, India

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ABSTRACT

Background: In the past few decades the issue of overweight and obesity has become a serious public health concern throughout the world. In India, 5% of the population is obese. Obesity is not an immediately fatal disease by itself, but is a risk factor for wide range of serious non communicable diseases in Indian population. **Aims:** This study was aimed to investigate the prevalence of obesity in a rural village, Thattankuttai population at Namakkal district, Tamil Nadu, India and to evaluate its relationship with hypertension, anemia and diabetes. **Materials and Methods:** This cross sectional study comprised of 215 subjects attending a local medical camp, aged between 18 – 80 yrs. Heights, weight, body mass index, systolic and diastolic blood pressure, random blood sugar, hemoglobin levels were monitored using standard methods. **Results:** Prevalence of overweight and obesity was 14.4% and 60.46% respectively and it was predominant among women (62%) than men (59.7%). Systolic blood pressure, diastolic blood pressure and random blood sugar were significantly elevated in obese subjects than in normal BMI subjects (control). Anemia was more prevalent among underweight (100%) and normal weight (81.61%) than in obese patients (59.53%). **Conclusion:** The results showed a higher trend of hypertension and diabetes and decreased trend of anemia with increase in body mass index. Periodic health camps, conducted at different places throughout India may help to detect diabetes, hypertension and anemia in undiagnosed population and thereby preventing the disease progression and complications.

Key words: Overweight, Obesity, Hypertension, Diabetes, Anemia.

INTRODUCTION

In the past few decades, the issue of overweight and obesity has become a serious public health concern throughout the world. In India, 5% of the population is obese. Obesity is not an immediately fatal disease by itself, but is a risk factor for wide range of serious non-communicable diseases in Indian population.¹ Our study was done among a rural population of Tamilnadu where no such previous studies have been carried out in the past. Obesity is most widely measured in terms of body mass index (BMI).² According to the WHO the desirable BMI cut-offs for Asians is considered to be between 18.5 and 22.9 kg/m². A

BMI of 23–24.9 kg/m² is considered as overweight and >25 kg/m² as obese.³ Although the terms overweight and obesity are often used interchangeably, overweight refers to an excess of body weight compared with height; obesity refers to an excess of body fat.²

Diabetes mellitus (DM) is a chronic progressive metabolic disorder characterized by hyperglycemia mainly due to absolute (Type 1 DM) or relative (Type 2 DM) deficiency of insulin hormone. The needs of diabetic patients are not only limited to adequate glycaemia control but also correspond with preventing complications; disability limitation

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and rehabilitation.⁴ Throughout the regions of the world, the burden of hypertension (HTN) varies remarkably and is a serious public health problem in both developed and developing countries. Both systolic and diastolic HTN are important predisposing factors of cardiovascular disease (CVD), chronic kidney disease and stroke.⁵ BMI is directly and independently associated with morbidity and mortality in HTN and type 2 DM patients.⁶

If the relationship between obesity and the risk for HTN and diabetes is not assessed early, it might lead to micro and macro vascular complications. The association of BMI with HTN and diabetes has long been the subject of epidemiological research, but it has not been sufficiently explored in rural population.⁷ Overweight/obesity is an important modifiable risk factor for cardiovascular disease (CVD) and other chronic diseases.⁸⁻¹¹ Excess weight has been shown to be associated with increased prevalence of type 2 diabetes, HTN, dyslipidemia, metabolic syndrome (MetS) and certain cancers; while weight loss dramatically reduces these obesity-related diseases.^{12,13} These diseases have become the main cause of death worldwide.¹⁴ The aim of the study was to examine the association between obesity and its co-morbidities co-morbidities like diabetes, HTN and anemia among rural population.

METHODS

A one-day camp was organized in a small rural village of Tamilnadu after obtaining permission from college authorities and village panchayat administrators. A cross sectional study was carried out in 215 participants, who attended this free medical camp at Thattankuttai village, belonging to the age group between 18-80 years. Gender-wise distribution of 215 subjects was 154 males and 61 females. Height was measured using height measuring scale with 0.1cm division value and weight using potable weighing machine without shoes. Blood pressure (BP) was determined using digital sphygmomanometer. Normal BP is defined as <120/80mmHg, pre-HTN as 120-139/80-89 mmHg, stage I HTN as 140-159/90-99 mmHg, and stage II HTN as equal to and above 160/100 mmHg.¹⁵ Random blood sugar (RBS) was determined using glucometer. Anemia was measured using hemoglobinometer and classified as mild (males: 11- 12. 9gm/dl; female: 10-11. 9gm/dl), moderate (8-10. 9) and severe (below 8gm/dl) anemia. BMI was calculated using the formula: weight (kg) / height (m²) and classified as normal (18.5 and 22.9 kg/m²), overweight (23–24.9 kg/m²)

and obese (> 25 kg/m²). Prior written consent was taken from the participants. Data obtained was analyzed by using percentage and mean.

RESULTS

All the participants consenting for the free medical camp were divided into 44 groups, based on BMI, namely normal, underweight, overweight and obese. Among 215 participants screened, overweight and obese subjects comprised 14.4% and 60.46% respectively. Obesity was found to be predominant among women (62%) than men (59.7%). Overweight was found to be predominant among men (14.28%) than in women (13.11%). Occurrence of underweight subjects was 1.86%. Gender-wise occurrence of study population is shown in Table 1.

Prevalence of HTN was 30.23%, comprising of 72.3% men and 27.69% women and prevalence of diabetes was 11.62%, comprising of 72% of men and 28% of women. The mean values of various parameters in different categories of BMI are shown in Table 2. In case of obese subjects, systolic blood pressure (SBP-132.90 mmHg), diastolic blood pressure (DBP-87.94 mmHg) and RBS (135.21mg/dl) were significantly elevated in comparison to normal BMI subjects (122.7 mmHg, 77.26 mmHg and 101.06 mg/dl). In case of overweight subjects, SBP (129.64 mmHg), DBP (80.54 mmHg) and RBS (123.9mg/dl) were significantly elevated than in that of normal BMI subjects (122.7 mmHg, 77.26 mmHg and 101.06 mg/dl). The high prevalence of stage I, II and pre-HTN was observed in obese (24%, 8.4%, and 45%) and overweight (16.12%, 12.9% and 45.16%) (Table 3).

Among normal weight subjects, only 6.12% were observed to be in diabetic state. The remaining populations (83.67%) had normal blood sugar level and 10.20% were found to be in pre-diabetic state. In case of overweight and obese subjects, the percentage of population in normal, pre diabetic and diabetic condition was 74.19%, 16.12%, and 9.67% and, 70.99%, 14.15% and 14.15% respectively (Table 4).

Table 1: Gender- wise occurrence of overweight and obesity and its associated disorders.

Parameter	Male	Female
Overweight	14.28%	13.11%
Obesity	59.70%	62%
Diabetes	11.68%	11.47%
HTN	30.51%	29.50%

Table 2: Mean values of various parameters in different BMI classes.

BMI Classes	SPB (mmHg)	DPB (mmHg)	RBS (mg/dl)	Hb (gm/dl)
Underweight (n= 4)	116.5	65.5	71.25	8.45
Normal weight (n= 49)	122.7	77.26	101.06	10.18
Overweight (n= 31)	129.64	80.54	123.9	10.84
Obese (n= 131)	132.90	87.94	135.21	11.61

SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; RBS: Random Blood Sugar; Hb: Hemoglobin

Table 3: Distribution of subjects in different categories of BMI and BP

BMI classes	Normal BP	Pre-HTN	Stage I-HTN	Stage II-HTN
Normal weight (n=49)	22 (44.89%)	16 (32.65%)	8 (16.32%)	3 (6.12%)
Under weight (n=4)	02 (50%)	01 (25%)	01 (25%)	0
Over weight (n=31)	8 (25.8%)	14 (45.16%)	5(16.12%)	4(12.9%)
Obese (n=131)	28(21%)	60(45%)	32(24%)	11(8%)

Values are expressed as No. of subjects and their percentage in parenthesis; HTN: Hypertension

Table 4: Prevalence of pre-diabetes and diabetes in different categories of BMI

BMI classes	Normal blood sugar	Pre-diabetes	Diabetes
Normal weight (n=49)	41(83.67%)	5(10.20%)	3(6.12%)
Under weight (n=4)	4(100%)	0	0
Over weight (n=31)	23(74.19%)	5(16.12%)	3(9.67%)
Obese (n=131)	93(70.99%)	19(14.5%)	19(14.5%)

Table 5: Distribution of subjects in different categories of BMI and Hb level.

BMI classes	Normal	Mild anemia	Moderate anemia	Severe anemia
Normal weight (n= 49)	9 (18.36%)	23(46.93%)	8(16.32%)	9(18.36%)
Under weight (n= 4)	0	01(25%)	02(50%)	01(25%)
Over weight (n= 31)	11 (35.48%)	12(38.70%)	4(12.90%)	3(9.67%)
Obese (n= 131)	53 (40.45%)	48(36.64%)	23(17.55%)	7(5.34%)

Among normal weight subjects, 18.36% were in normal level, 46.93% were mildly anemic, 16.32% were moderately anemic and 18.36% were severe anemic state was 35.48%, 38.7%, 12.9%, 9.67% and 40.45%, 36.64%, 17.55%, 5.34% (Table 5).

DISCUSSION

Out of the total population studied, there was more number of obese and overweight populations than that of normal and underweight. Female obese population was more predominant than male, but in overweight category, males dominated the females. Jayasingh *et al.* has already showed that the prevalence of obesity and overweight was more among females than in men, but in the current study prevalence of overweight was more among males.⁷

In our study, obese population was more prone to hypertensive condition than that of normal weight population. Similar studies conducted by Lie *et al.* also found that prevalence of HTN was higher among over weight and obese population.¹⁶

The percentage of diabetic patients was more in overweight and obese population than in normal weight population. Jayasingh *et al.* Shiju *et al.* and Lei *et al.* have already showed positive association between increase in BMI and diabetes.¹⁶⁻¹⁸

Overweight and obese population were less prone to anemia than that of normal and underweight population. Similar observations were found by various other authors like Malhotra *et al.* and Bhattacharjee *et al.* that there was a significant association between hemoglobin (Hb) level and BMI. With the increase in BMI, Hb level increased significantly.^{19, 20}

Thus SBP, DBP and RBS were significantly elevated in obese subjects than in normal BMI subjects (control) but anemia was more prevalent among underweight (100%) and normal weight (81.61%) than in obese patients (59.53%).

Thus, it may be concluded that a fairly high prevalence of overweight and obesity among Thattankuttai population was observed. Among 215 participants screened, overweight and obese subjects comprised to 14.4% and 60.46% respectively. Prevalence of obesity was found to be quite high in this rural community. Increase in body weight may also be due to the changes in lifestyle factors which, have also started impacting the rural community, like fat-rich diet, more usage of alcohol and tobacco, increased energy intake and low energy output due to lesser involvement in physical activities.²¹

CONCLUSION

The results showed a higher trend of HTN and diabetes and decreased trend of anemia with increase in BMI. Overweight and obesity has become a major health problem in this rural community. Periodic health camps can be conducted at different places throughout India as it will help to detect diabetes, HTN and anemia in undiagnosed population and thereby preventing the disease progression and complications.

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CONFLICT OF INTEREST

There are no conflicts of interest to declare.

ABBREVIATION USED

BMI: Body Mass Index; HTN: Hypertension; DM: Diabetes Mellitus; CVD: Cardiovascular Disease; MetS: Metabolic Syndrome; BP: Blood Pressure; RBS: Random Blood Sugar; DBP: Diastolic Blood Pressure; SBP: Systolic Blood pressure; Hb: Hemoglobin.

REFERENCES

- Gothankar JS. Prevalence of obesity and its associated comorbidities amongst adults. *Natl J Community Med.* 2011;2(2):221-4.
- Brown CD, Higgins M, Donato KA, Rohde F, Garrison R, Obarzanek E, *et al.* Body Mass Index and the Prevalence of Hypertension and Dyslipidemia. *Obes Res.* 2000; 8(9): 605–19. <http://dx.doi.org/10.1038/oby.2000.79>; PMID: 11225709.
- Low S, Chin MC, Ma S, Heng DM, Deurenberg Y. Rationale for Redefining Obesity in Asians. *Ann Acad Med Singap.* 2009; 38(1):66–74. PMID: 19221673
- Michael JF. Diabetes Treatment, Part 1: Diet and Exercise. *Clin Diabetes.* 2007;25(3):105-9.
- Youssef MK, Bharati V M, SaiRam KR, Vidya NA, Alan FA, Anil C, *et al.* Burden and predictors of hypertension in India: results of SEEK (Screening and Early Evaluation of Kidney Disease) study. *BMC Nephrol.* 2014;15(6):42. <http://dx.doi.org/10.1186/1471-2369-15-42>; PMID: 24602391; PMCID: PMC4015417.
- Pi-Sunyer FX. Medical hazards of obesity. *Ann Intern Med.* 1993;119:655-60. http://dx.doi.org/10.7326/0003-4819-119-7_part_2-199310011-00006; PMID: 8363192
- Jayasingh CM, Christina AS. Prevalence of overweight and obesity and its association with hypertension and diabetes: a study among manakkarambai population of thanjavur district. *Int J Med Sci Public Health.* 2013;2(3):618-21. <http://dx.doi.org/10.5455/ijmsph.2013.200420132>.
- Poirier P, Giles TD, Bray GA, Hong Y, Stern JS, Pi-Sunyer FX, *et al.* Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. *Circulation.* 2006;113(6):898–918. <http://dx.doi.org/10.1161/circulationaha.106.171016>; PMID: 16380542.
- Li R, Lu W, Jia J, Zhang S Shi L, Li Y, *et al.* Relationships between indices of obesity and its cardiovascular comorbidities in a Chinese population. *Circ J.* 2008;72(6):973–8.
- Nguyen NT, Magno CP, Lane KT, Hinojosa MW, Lane JS. Association of hypertension, diabetes, dyslipidemia, and metabolic syndrome with obesity: findings from the National Health and Nutrition Examination Survey, 1999 to 2004. *J Am Coll Surg.* 2008;207(6):928–34. <https://doi.org/10.1016/j.jamcollsurg.2008.08.022>; PMID: 19183541.
- Hu D, Xie J, Fu P, Zhou J, Yu D, Whelton PK, *et al.* Central rather than overall obesity is related to diabetes in the Chinese population: The Inter ASIA Study. *Obesity.* 2007;15(11):2809–16. <http://dx.doi.org/10.1038/oby.2007.333>; PMID: 18070772.
- Alison HM, Penny KE. Contemporary strategies for weight loss and cardiovascular disease risk factor modification. *Curr Cardiovasc Risk Rep.* 2009;3(2):109–18. <https://dx.doi.org/10.1007/s12170-009-0019-6>; PMID: 18937896.
- Sjostrom L, Lindroos AK, Peltonen M, Torgerson J, Bouchard C, Carlsson B, *et al.* Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. *N Engl J Med.* 2004;351:2683–93. <http://dx.doi.org/10.1016/j.jvs.2005.02.005>; PMID: 15616203.
- Ogden CL, Yanovski SZ, Carroll MD, Flegal KM. The epidemiology of obesity. *Gastroenterol.* 2007;132(6):2087–102. <http://dx.doi.org/10.1053/j.gastro.2007.03.052>; PMID: 17498505.
- Braunwald E, Fauci AS, Kasper DL, Hauser SL, Longo DL, Jameson JL. *Harrison's Principle of Internal Medicine.* Vol.1. 15th ed. New York: Tata McGraw- Hill publishers. 2001. Pp- 571-8.
- Lei Z, Wei-Hong Z, Lian Z, Pei-Yu W. Prevalence of overweight/obesity and its associations with hypertension, diabetes, dyslipidemia, and metabolic Syndrome: a survey in the suburban area of Beijing, 2007. *Obes Facts.* 2011;4(4):284–9. <https://dx.doi.org/10.1159/000331014>; PMID: 21921651.
- Shiju TM, Madathil D, Viswanathan P. An alarming prevalence of diabetes and its associated risk factors among college going Indian Adults: a retrospective study. *Int J Med Sci Public Health.* 2013;2(3):603-8. <http://dx.doi.org/10.5455/ijmsph.2013.180420131>.
- Elham AA, Mona A, Abdishakur A, Nibal AB, Elham ZA, Monira P. The prevalence, risk factors, and screening measure for prediabetes and diabetes among Emirati overweight/obese children and adolescents. *BMC Public Health.* 2015;15:1298. <http://dx.doi.org/10.1186/s12889-015-2649-6>; PMID: 26704130; PMCID: PMC4690431.
- Bhattacharjee S, Banerjee R, Roy JK, Mandal S, Biswas R, Chakraborty M. Under nutrition and Anaemia in rural adults—a cross-sectional study in rural north Bengal. *Indian J Prev Soc Med.* 2010;41(1):33-6.
- Malhotra P, Kumari S, Kumar R, Varma S. Prevalence of anemia in adult rural population of north India. *J Assoc Physicians India.* 2014;52:18-20. PMID: 15633712.
- Tazeen HJ, Nish C, Gregory P. Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in an Indo-Asian Population. *Can Med Assoc J.* 2006;175(9):1071-77. <http://dx.doi.org/10.1503/cmaj.060464>; PMID: 17060656; PMCID: PMC1609152.