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## A Cross Sectional Study to Assess the Relationship between Obesity and Type 2 Diabetes among Rural Population in Tamil Nadu, India.

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### ABSTRACT

To study about the prevalence of obesity among rural population in Tamil Nadu using anthropometric measures and its relationship with type 2 diabetes mellitus. Cross sectional study was done among the adult population (aged 35 years and above) residing in the field practice area of rural health center (Sripuram, Tamil Nadu) covering a population of 32,000. Random sampling method was used to select the sample size. Data were collected in a pre structured questionnaire by interviewing subjects through house-to-house visits. The data was collected and analyzed using statistical software and chi square and proportional statistical test were applied. Results show that out of 505 respondents 236[46.7%] were overweight and 28[5.5%] had class 1 obesity and 21[0.4%] had class 2 obesity according to BMI. Out of 236 overweight individuals 32[13.6%] adults were associated with diabetes mellitus and 11[39.3%] of class 1 obesity and all [100%] of class 2 obese patients were associated with diabetes mellitus,  $p[0.000]$ . Nearly 41[14.7%] out of 278 individuals with increased waist circumference were associated with diabetes  $p[0.004]$ . These results show that there is a strong association between obesity and diabetes.

**key words:** Obesity, Diabetes, physical activity.

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## INTRODUCTION

The number of people with diabetes is increasing due to population growth, aging, urbanization, and increasing prevalence of obesity and physical inactivity. The proportions of people with type 2 diabetes and obesity have increased throughout Asia, and the rates of increase shows no signs of slowing. The International Diabetes Federation estimates that in 2003, 194 million people had diabetes, and that by 2025, 333 million people will have this disease. Some argue that Asia is emerging as the epicentre of this epidemic [1].

Obesity is a common risk factor for the development of type 2 diabetes mellitus and cardiovascular diseases. The relationship between obesity and diabetes is of such interdependence that the term 'diabesity' has been coined [2].

The association of obesity with Type II Diabetes is well known. Even with an acceptable body weight range, weight gain could increase the risk of diabetes [3]. An excess of body fat specially concentrated within the abdomen has an increased risk of diabetes [4]. The cut-off limits for waist circumference for Indians have been recommended to be 90 cm for males and 80 cm for females. Abdominal obesity is defined by waist circumference above these limits.

### Aims and Objective

- To study the prevalence of obesity among rural population by using BMI calculation
- To find out the relationship between obesity and type 2 diabetes.

## MATERIALS AND METHODS

The sampling method employed to choose the sample size was simple random sampling. Age group >20 yrs who are resident in Sripuram, rural health centre cover field area of Sri Balaji Medical College and Hospitals, are selected through house to house survey by simple random technique. The total population of Sripuram, Rural Health Center is around 32000. Random number table was generated using computer software and houses for the study selected accordingly. All eligible residents from each house are taken for the study to get the required sample size of 505 for the study. If a house was found locked or eligible subject not available, the next house was considered.

### Data collection technique

Data collection was done by household survey by direct interview using a pre- tested and structured questionnaire including demographic details, socio- economic status, anthropometry measurements like height, weight, waist circumference, and risk factors for diabetes include age, physical activity, BMI, family history of diabetes, and personal history like smoking and alcohol consumption. The questionnaire was filled by the interviewer on the spot after getting the informed consent from the respondent.

### Anthropometric measurement

Body weight was measured with the subject standing still on weighing scale and weight equally distributed on each leg. Subjects were instructed to no footwear, while their weight was being measured.

Height was measured using a non stretchable tape with the subject in an erect position against a vertical surface. Body mass index was calculated by dividing the weight (in kilograms) with the square of height (in meters).

### BMI calculation:

Body mass index was calculated by dividing the weight (in kilograms) with the square of height (in meters). BMI defined <18.5kg/m<sup>2</sup> underweight, 18.5-24.9 kg/m<sup>2</sup> normal, and 25-29.9 kg/m<sup>2</sup> overweight and >30 kg/m<sup>2</sup> obesity [6].

**Waist circumference**

Waist circumference was measured using a tailor’s tape at a point mid way between tip of iliac crest and last costal margin in the back and at umbilicus in the front.

Waist Circumference values >94 and >80 cm for men and women respectively was considered high according to world health organization [7].

**Diagnosis of diabetes mellitus**

After informed consent, the interviews were made in the evening. Then they were briefed for fasting blood glucose testing in the next day morning. The subjects were instructed to be on overnight fasting minimum 8 hrs. Next morning, after confirming fasting, blood glucose was measured by one touch glucometer. All those who had Fasting Blood Glucose more than 126 mg/dl were considered to be a diabetics. We followed the American Diabetic Association (ADA) criteria for defining the type 2 diabetes. Fasting plasma glucose of >126 mg/dl (after no caloric intake for at least 8 hours)

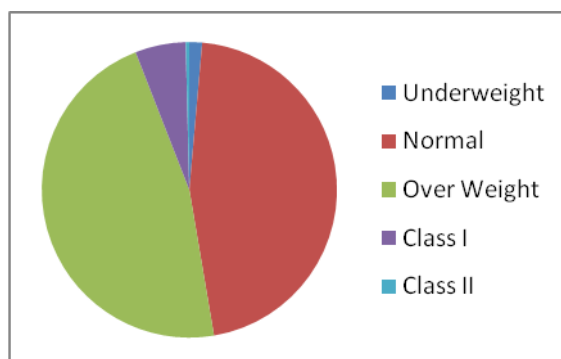
**RESULTS**

Among a total population of 505 adults, 279[55.2%] are males and 226[44.8%] were females. 274[54.3%] were below 35years, 198[39.2%] were between 35 to 49yrs, 33[6.5%] were over 49yrs. The prevalence of overweight and class 1 obesity and class 2 obesity according to BMI was found to be 236[46.7%], 28[5.5%] and 2[0.4%] respectively. According to the waist circumference 278[55.04%] had increased waist circumference of these 32[13.6%] of overweight ,11[39.3%] of class 1 obesity and 2[100%] of class 2 obesity had associated diabetes p[0.000]. Those with increased waist circumference, 41[14.7%] with p[0.004] had associated diabetes .

**BMI AND WAIST CIRCUMFERENCE DISTRIBUTION**

	Frequency	Percentage
<b>BMI</b>		
Underweight	7	1.4%
Normal	232	45.9%
Over Weight	236	46.7%
Class I	28	5.5%
Class II	2	0.4%
<b>WAIST CIRCUMFERENCE</b>		
Normal	227	44.95%
High	278	55.04%

**BMI DISTRIBUTION**



**ASSOCIATION BETWEEN OBESITY AND DIABETES**

		Diabetes				Chi square Test	P Value
		No		Yes			
		N	%	N	%		
BMI	Underweight	7	100	0	0	41.292 5 df	0.000 ***
	Normal	220	94.8	12	5.2		
	Over Weight	204	86.4	32	13.6		
	Class I	17	60.7	11	39.3		
	Class II			2	100		

**ASSOCIATION BETWEEN WAIST CIRCUMFERENCE AND DIABETES**

Variable	category	Diabetes		OR (95%CI)	P-Value
		Frequency	percent		
Waist circumference	Normal	15	6.6%	Ref 2.445(1.316-4.544)	0.004
	High	41	14.7%		

**DISCUSSION**

**RELATION OF TYPE2 DIABETES WITH ANTHROPOMETRIC MEASUREMENTS**

**BMI**

There is significant association between the BMI and DM (p- Value: 0.000\*) .In agreement with the current study, Ahmad et al [8] India and Yemane et al [9] in Ethiopia reported the association of BMI with undiagnosed DM. Of the people diagnosed with type II diabetes, about 80 to 90 percent are also diagnosed as obese. The relative risk of developing type 2 diabetes increases tenfold in obese women and eleven fold in obese men. Obesity is therefore a major risk factor for type 2 diabetes. So several studies supported that early identification of high BMI, would give opportunity for primary prevention and early diagnosis of the diabetes. Also it would suggest that Indians, especially, have to maintain lower BMI to prevent diabetes.

**Waist circumference**

There is significant association between waist circumference and undiagnosed diabetes. (P- value 0.004). The finding was consistent with previous studies of Azimi-Nezhad et al (10) in Iran, and Ahmad et al [8] in India with odds ratio (95%CI) .

This study show that the prevalence of obesity in the rural population of sripuram was 52.6% and 16.91 % of them had associated diabetes mellitus. A similar study was conducted by Dr.Hetal pandya, Vadodara district, Gujarat around 70% of these diabetic patients were obese. Statistically significant increase in prevalence of obesity in diabetics (Diabesity) is noted when Indian indicators were used. This was true for both the indicators BMI as well as WC which noted 17% and 32% more obesity respectively. The increase in type 2 diabetes is closely linked to changes towards a western lifestyle (high-energy diets and reduced physical activity the popularity of high fat, high energy diets) and a rise in the prevalence of obesity which contributes to insulin resistance. To reduce the chances of developing diabetes, a healthy weight has to be maintained and physical activity has to be increased. To aid in weight loss, a high fiber, low carbohydrate diet and 20 to 30 minutes of moderate activity per day are recommended. Even a small weight loss (five to 10 percent) can prevent diabetes - or prolong the chance that you will develop the disease - even if one falls into a high risk category, according to The Obesity Society. And in those having diabetes, this small weight loss can reduce the amount of medication needed, as well as help prevent common complications associated with diabetes, such as blindness, stroke and heart attacks [5,10].

**REFERENCES**

[1] <http://www.idf.org/diabetesatlas/5e/Update2012>.



- [2] Golay A<sup>1</sup>, Ybarra J Link between obesity and type 2 diabetes.
- [3] World Health Organization. Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications. Geneva: Department of Non-communicable Disease Surveillance, World Health Organization;1999.
- [4] Menon VU, Kumar KV, Gilchrist A, Sugathan TN, Sundaram KR, Nair V, et al. Diabetes Res Clin Pract 2006; 74 : 289-94
- [5] Mohan V, Deepan M, Deepa R. Diabetologia.2006;49(6):1175-1178
- [6] [http://apps.who.int/bmi/index.jsp?intro Page=intro\\_3.htm](http://apps.who.int/bmi/index.jsp?intro Page=intro_3.htm)
- [7] Waist circumference and waist-hip ratio. Report of a WHO expert consultation World Health Organization 2008, WHO Press,
- [8] Ahmad J, Masoodi MA, Ashraf M, Rashid R, Ahmad R, et al. Al Ameen J Med Sci 2011;4: 38-44.
- [9] Yemane T, Belachew T, Asaminew B, Befekadu O. Ethiopia J Health Sci 2007;17: 107-114.
- [10] Azimi-Nezhad M, Ghayour-Mobarhan M, Parizadeh MR, Safarian M, Esmaeili H, et al. Singapore Med J 2008;49: 571-576.