# OBESITY AS RISK FACTOR IN TYPE-2 DIABETES MELLITUS IN MIDDLE AGED WOMEN

**Ambareesha K[1], Nagadeepa W[2], Suresh M[3], Shoba Rani N[4]**

**Received: 2017**
**Revised: 2017**
**Accepted: 2017**

[1]Assistant Professor, [2]Associate Professor, Department of Physiology, MNR Medical College & Hospital, Sangareddy, Telangana
[3]Reader, Department of physiology, Sri Ramakrishna dental college and hospital, Coimbatore.
[4]RMO, MNR Homoeopathic Medical College & Hospital, Sangareddy, Telangana

***Corresponding author:** Dr. K. Ambareesha, Assistant Professor, Department of Physiology, MNR Medical College& Hospital, Sangareddy, Telangana- 502294.
**Email:**
drambreeshphysio@gmail.com

## ABSTRACT

**Background:** Type 2 diabetes is a common chronic disease resulting from a complex inheritance-environment interaction along with other risk factors such as obesity and sedentary lifestyle. Type 2 diabetes and its complications constitute a major worldwide public health problem, affecting almost all populations in both developed and developing countries like India with high rates of diabetes-related morbidity and mortality. **Method:** 110 women volunteers of age 35 to 55 years depending upon body mass index, were divided into five groups. Control – (BMI < 25 kg / m2), Group I (BMI 25-29.9 kg / m2), Group II (BMI 30-34.9 kg / m2), Group III (BMI 35-39.9 kg / m2), Group IV (BMI > 40 kg / m2) were selected as subjects. Their Body Mass Index, Waist – Hip circumference ratio (W/H), Fasting blood sugar (FBS), lipid profile: serum triglycerides (TG), serum total cholesterol and HDL, VLDL cholesterol were assessed. **Result:** There is a close association between obesity and type 2 diabetes. The mean values of FBS, HDL, TG & VLDL are significantly higher in group I compared to controls. The mean values of W/H ratio, FBS, HDL, TG & VLDL are higher in group II, III and IV compared to controls. **Conclusion: I**n the middle aged women obesity is the major factor which increases the risk for diabetes. Obesity plays a role by altering homeostasis of the body; it does this by bringing about the changes in the various parameters studied.

**KEYWORDS:** Middle aged women; Obesity; Type-2 diabetes mellitus

## INTRODUCTION

It is estimated that diabetes affects 387 million people worldwide [1]. Obesity has risen to epidemic proportions in India, leading to an emerging epidemic of type 2 diabetes. It is a particular problem among middle aged women, half of whom are obese (BMI ≥30 kg/m2) [2]. Type 2 diabetes mellitus is characterized by hyperglycemia, insulin resistance and relative impairment in insulin secretion[3]. The pathogenesis of type 2 diabetes is poorly understood, but is heterogeneous and both genetic factors affecting insulin release and responsiveness and environmental factors, such as obesity, are important [4]. The prevalence of diabetes increases with age and reached a peak in the 60–64 age groups [5]. Systolic blood pressure (SBP), waist–hip ratio and family history of diabetes were the most significant risk factors for type 2 diabetes. The adjusted analysis model indicated that women with early menopause (45 years of age) were 3.4-fold and 2.7-fold more likely to suffer from type 2 diabetes and pre-diabetes respectively in comparison to women with normal age at menopause[6]. More attention should be given to elderly women with early menopause, elevated systolic blood pressure and increased obesity-related measures, who are at high risk of pre-diabetes and type 2 diabetes [7]. Studies of whites indicate that central or abdominal obesity is an independent risk factor for diabetes, but there have been no data on middle aged women. So we planned to see the

Access this article online
Quick Response Code

ISSN: 2523-6695 (print)
2523-6709 (Online)



**Cite this article as:** Ambareesha K, Nagadeepa W, Suresh M, Shoba Rani N. Obesity as risk factor in type-2 diabetes mellitus in middle aged women. IJCRPP. 2017;1(1):6-9.

effect of obesity on type 2 diabetes in middle aged women.

## METERIALS AND METHODS

**Study design:** An Observational study

**Ethics approval:** Written informed consent was obtained from the each participant and Institutional Ethical Committee permission was taken.

**Study location**: The study was conducted at Department of physiology, MNR Medical College & Hospital, Sangareddy.

**Study period: T**he period June 2015 to January 2016.

**Sample size:** 110 volunteer women of age 35 to 55 years were selected as subjects. Baseline examination was performed

**Inclusion criteria:** Only female subjects with BMI. 25 Kg/m2, with no family history of diabetes and with no history of cardiovascular diseases are selected.

**Exclusion criteria: S**ubjects with past history of smoking and alcohol intake and subjects with family history of diabetes and hypertension.

**Grouping:** According their BMI values participants were divided into 5 groups as mentioned below

**METHODS**

**Body Mass Index calculation**: Standing height, weight was recorded without shoes and with light clothes by using a Krups weighing machine with a least count of 100 gm.

BMI was calculated by the formula: BMI = weight (kg) / height (mt2).

**Table 1: WHO classification of obesity [8].**

| Grouping | Weight | BMI ( kg /mt$^2$) |
|---|---|---|
| Control | Normal weight | 18.5 – 24.9 |
| Group I | Over weight | 25.0 – 29.9 |
| Group II | Class I Obesity | 30.0 – 34.9 |
| Group III | Class II Obesity | 35.0 – 39.9 |
| Group IV | Class III Obesity | 40.0 |

**Waist – Hip circumference ratio (W/H) estimation [9]** was measured by using a graduated tape when subjects were in a standing position. Waist circumference was obtained at the level midway between the lower rib margin **a**nd iliac crest while the subjects breathe out gently. Hip circumference was taken at the level of maximal gluteal protrusion. Waist hip ratio was calculated by dividing waist circumference by Hip circumference.

**Blood pressure:** Resting BP was recorded as the first and fifth and fifth Korottkoff sound by auscultatory methods in sitting position with sphygmomanometer from the right arm of the subject who were asked to sit for 5 minutes before the measurement. The mean of three measurements was used in the analysis [10].

**Blood glucose:** Glucometer was used to estimate the blood glucose level. Glucose value was expressed as mg/dl or mmol/l [11].

**Study of Lipid profile: Collection of blood sample:** After overnight fasting for 12 hrs, from each subject 3 ml of blood was obtained from cubital vein in a clean dry bottles containing EDTA. After 1 hr the serum was separated by centrifugation. From the serum the following parameters were estimated: Serum cholesterol, serum triglyceride and serum HDL cholesterol [12].

VLDL cholesterol = It is calculated by Totalcholesterol / 5.LDL cholesterol = it is calculated by Total cholesterol – (HDL cholesterol + VLDL cholesterol)

## RESULTS

The present study revealed that the mean values of waist hip ratio, fasting blood sugar, total cholesterol, triglycerides, and VLDL of obese women of group I, II, III and IV showed statistically highly significant increase. The mean values of LDL of obese women of group III & IV showed statistically significant and highly significant increase in values respectively. The mean values of pulse rate of obese women of group I, II, III, IV showed statistically insignificant increase in values. The mean values of SBP of obese women of group I, II, III showed increase in values but were found statistically insignificant. In group IV showed statistically highly significant increase in values. The mean values of DBP of obese women of group I, II, III, IV showed increase in values. In group IV showed statistically highly significant increase in values**.**

The mean values of FBS, HDL, and TG& VLDL are significantly higher in group I when compared with control The mean values of pulse rate, SBP, DBP W/H RATIO, FBS, TC, HDL, TG, LDL and VLDL are significantly higher in group II when compared with control. Within group III, the mean values of W/H RATIO, FBS, HDL,TG and VLDL are higher with more significance ($p<0.01$). The mean values of TC and LDL are higher with less significance ($p<0.05$).The mean values of Pulse rate, SBP, DBP W/H RATIO, FBS, TC, HDL, TG, LDL and VLDL are significantly higher in group II when compared with control. Within group IV, the mean values of BMI,W/H RATIO, FBS, HDL,TG and VLDL are higher with more significance ($p<0.01$). The mean values of TC and LDL are higher with less significance ($p<0.05$).

**Table 2:** Comparison of various parameters control and group I, II, III and IV

| Parameters | Controls | Group I | Group II | Group III | Group IV |
|---|---|---|---|---|---|
| Pulse rate | 75.65±7.84 | 75.80 ± 4.62 | 76.08 ± 5.82 | 76.51 ± 5.15 | 77.86±4.53 |
| SBP (mm/Hg) | 110.20± 7.81 | 121.33±13.05 | 121.6± 14.83 | 126.66± 11.55 | 144.52 ±10.3*** |
| DBP(mm/Hg) | 74.26 ±5.69 | 76.48 ± 7.39 | 78.25 ± 9.33 | 82.60 ± 9.42 | 86±5.45*** |
| W/H RATIO | 0.77 ±0.025 | 0.78 ± 0.02 | 0.81 ± 0.03*** | 0.85 ± 0.04*** | 0.88±0.01*** |
| FBS(mg/dl) | 90.73 ± 13.64 | 151 ± 41.99*** | 160.5±44.6*** | 196.83±57.4*** | 200.6±34.8*** |
| TC (mg/dl) | 150.33 ± 43.24 | 177.86± 36.74 | 179.77 ± 40.08 | 182.47 ± 33.28* | 186.8±37.33 |
| HDL(mg/dl) | 46.58 ±7.38 | 44.35±10.57** | 42.60 ± 10.32 | 40.58 ± 10.43** | 39.21± 6.65** |
| TG(mg/dl) | 110.93 ± 28.40 | 162±102.67** | 169±104.8*** | 179.3±47.4*** | 209.8±29.5*** |
| LDL(mg/dl) | 91.69 ±35.04 | 97.01 ± 21.14 | 99.03 ± 25.95 | 100.07 ± 22.96* | 144.46±9.87** |
| VLDL(mg/dl) | 22.6 ±6.27 | 27.77±21.11** | 32.31±20.37** | 34.52 ± 8.75** | 39.23± 6.06*** |

Values are expressed as mean±SD.* P<0.05** p <0.01, *** p <0.001, All values are compared with control groups.

## DISCUSSION

The proportions of people with type 2 diabetes and obesity have increased throughout Asia, and the rate of increase shows no sign of slowing. People in Asia tend to develop diabetes with a lesser degree of obesity at younger ages, suffer longer with complications of diabetes and die sooner than people in other regions. According to Yogesh Saxena et al [12]., childhood obesity has increased substantially and the prevalence of type 2 diabetes has now reached epidemic levels in Asia. The health consequences of this epidemic threaten to overwhelm health-care systems in the region[4]. Urgent action is needed and advocacy for lifestyle changes is the first step. Countries should review and implement interventions and take a comprehensive and integrated public-health approach.

Diabetes has been known in India for centuries as a disease of the affluent class. India faces a grave health care burden due to the high prevalence of type 2 diabetes and its sequelae, as a result of societal influences and changing lifestyle[13]. Obesity is one of the potentially modifiable risk factor for type 2 diabetes [13]. The results of the present study are in line with these earlier studies and indicate that the obesity alters body homeostasis and probably results in metabolic changes leading to the increased risk of diabetes. Many intervention studies have proven that, modest weight loss has been achieved by lifestyle interventions in overweight subjects with impaired glucose tolerance [14]. It is well established that those developing type 2 diabetes have a higher body weight than control populations reflecting the strong epidemiological association between obesity and the development of diabetes[15]. Our results prove this statement.

In contrast, much less attention has been paid to the significance of obesity in clinic populations with diabetes. Obesity is an independent risk factor for cardiovascular and other metabolic diseases[16]. In type 2 diabetes, weight loss has a beneficial effect on indices of glycaemic control and treatment requirements and those who achieve pronounced weight loss experience normalization of insulin sensitivity and blood glucose concentrations[17]. In clinical practice this is best exemplified by bariatric surgery in obese type 2 diabetic patients, which often leads to enduring remission of the disease[18].

## CONCLUSION

The relationship between obesity and diabetes mellitus has been reported to be age and gender dependent. However, this relationship has not been extensively studied in middle aged women in India. Clarification of this issue may help us to create more effective public awareness on diabetes mellitus via weight control. The present study results will definitely add to this aspect and help to take preventive measures in middle aged women.

**Acknowledgments:** The authors thank all participants, Management MNR Medical College & Hospital for their participation and cooperation throughout the study.

**Conflict of interest: Nil**

**Source of funding: Nil**

## REFERENCES

1. McNeely MJ, Boyko EJ: Type 2 diabetes prevalence in Asian Americans: results of a national health survey. Diabetes Care 27:66–69, 2004

2. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999–2000. JAMA 2002; 288: 1723–1727.
3. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2009; 32(Suppl 1): S62–S67.
4. Steven E. Kahn, Mark E. Cooper, Stefano Del Prato. Pathophysiology and treatment of type 2 diabetes: perspectives on the past, present and future. Lancet. 2014 Mar 22; 383(9922): 1068–1083.
5. Naoko Mukai, Yasufumi Doi, Toshiharu Ninomiya, Yoichiro Hirakawa, Masaharu Nagata, Daigo Yoshida, etal. [1]Trends in the prevalence of type 2 diabetes and prediabetes in community-dwelling Japanese subjects: The Hisayama Study. J Diabetes Investig. 2014 Mar 23; 5(2): 162–169.
6. Tran Quang Binh, Bui Thi Nhung. Prevalence and risk factors of type 2 diabetes in middle-aged women in Northern Vietnam. Int J Diabetes Dev Ctries DOI 10.1007/s13410-015-0372-6
7. Yoriko Heianza, Yasuji Arase, Satoru Kodama, Shiun Dong Hsieh, Hiroshi Tsuji, Kazumi Saito et al., Effect of Postmenopausal Status and Age at Menopause on Type 2 Diabetes and Pre diabetes in Japanese Individuals: Toranomon Hospital Health Management Center Study 17 (TOPICS 17). Diabetes Care. 2013;36(12):4007–4014.
8. Bethesda MD. National Institutes of Health. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults (NIH Publication No. 98-4083). 1998
9. Waist Circumference and Waist-Hip Ratio Report of a WHO Expert Consultation GENEVA, 8–11 DECEMBER 2008. Available at: http://apps.who.int/iris/bitstream/10665/44583/1/9789241501491.eng.pdf . Assessed: 10.5.2017
10. Ethel M Frese, Ann Fick, Steven Sadowsky. Blood Pressure Measurement Guidelines for Physical Therapists. Cardiopulm Phys Ther J. 2011; 22(2): 5–12.
11. Informed Health Online [Internet]. Type 1 diabetes: Measuring sugar levels in blood and urine yourself. Last Update: June 29, 2017; Next update: 2020.
12. Yogesh Saxena. Eevaluation of dynamic function test in normal obese individuals. IJPP 2008;52(4):375-382
13. King H, Aubert RE, Herman WH. Global burden of diabetes 1995-2025: prevalence, numerical estimates and projections. Diabetes Care. 1998; 21:1414-31
14. Pinkney J. Prevention and cure of type 2 diabetes. BMJ.2002;325(7358):232-3.
15. Pan XR, Li GW, Hu YH. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and diabetes study. Diabetes Care 1997;20:537–544
16. Torgerson JS, Hauptman J, Boldrin MN. The prevention of diabetes in obese subjects (XENDOS) study: a randomized study of as an adjunct to lifestyle changes for the prevention of type 2 diabetes in obese patients. Diabetes Care 2004;27:155–161
17. Turner RC. UK Prospective Diabetes Study Characteristics of newly presenting type 2 diabetic patients: estimated insulin sensitivity and islet β-cell function. Multi-centre study. Diabet Med 1988;5(5):444–448
18. Rimm EB, Stampfer MJ, Giovannucci E. Body size and fat distribution as predictors of coronary heart disease among middle-aged and older US men. Am J Epidemiol 1995; 141(12): 1117–1127