# Prevalence of Obesity and Hypertension in Newly Diagnosed Type 2 Diabetes Mellitus (T2dm) Patients Of Amritsar

**Kaur[1], N. and Sidhu[2], S.**
[1]Dept. of human Genetics, Guru Nanak Dev University, Amritsar, Punjab.
email:hazranirmaljitkaur4u@gmail.com
[2]Profeessor, Dept. of Human Genetics, Guru Nanak Dev University, Amritsar, Punjab.
email- shardasidhu@hotmail.com

## Abstract

The present study was conducted to observe the prevalence of obesity and hypertension in newly diagnosed diabetic patients of Amritsar (Punjab), attending diabetic clinics. A total sample of 300 newly diagnosed diabetic patients including 162 males and 138 females were studied to acess the prevalence of obesity and hypertension. The prevalence of obesity in diabetic males and females was 58.02% and 73.91% according to BMI, 88.27% and 91.3% according to WC, while 98.14% and 96.3% according to WHR and 85.18% and 90.59% according to WSR, respectively. The prevalence of hypertension was 88.2 % and 84.7% in diabetic males and females, respectively. From the result, it was observed that the percentage prevalence of obesity and hypertension was quite high in diabetic patients of Amritsar. The prevalence of abdominal obesity was higher than general obesity. The percentage prevalence of obesity in diabetic females was higher than diabetic males while the diabetic males were more hypertensive than diabetic females. To manage the profile of the diabetic patients, proper awareness and prevention and management of obesity and hypertension is essential.

**Keywords**: **Obesity, Diabetes, Hypertension, Amritsar, T2DM patients.**

## Introduction

Diabetes is a chronic non-communicable disease having serious health, economic and social consequences. The World Health Organisation has recently acknowledged that India is the diabetic capital of the world. According to *Patel et al (2011),* the overall number of people with diabetes in India (based on *the ICMR – INDIAB* study) is estimated to be 62.4 million and this was also confirmed by the 5th edition of the Diabetes Atlas, which gave a figure of 61.3 million people with diabetes in India in the age group of 20 – 79 years. In India the prevalence of diabetes is growing rapidly in both urban and rural areas *(Pradeepa et al, 2012).* The increasing prevalence of diabetes is associated with increased rate of overweight and obesity. It has been found by *Sharma and Jain (2009),* that prevalence of diabetes increases by a factor of 2-3 folds in obese individuals, 5-fold in moderately obese and 10-fold in severe obese persons. It has been estimated by *Hossain et al (2007)* that 90% of type 2 diabetes mellitus (T2DM) patients are attributable to excess body weight. *Arner et al (2010)* reported that newly diagnosed T2DM patients are more overweight than non-diabetic patients and they further reported that obesity plays an important role in pathogenesis of T2DM. *Klein et al (1996)* reported that 50% of the subjects with T2DM have

113

hypertension can be directly attributed to obesity. Obesity is considered a major risk factor for T2DM and hypertension by *Mugharbel et al (2003) and Waghmare et al (2012)*. Obesity has reached epidemic propotions globally with more than 1 billion adults overweight – atleast 300 million of them clinically obese *(Al-Johari, 2011)*. Clinical evidence suggests that association of diabetes with central obesity is stronger than the general obesity. Waist circumference (WC) and Waist-Hip-Ratio (WHR) has been used for measures of central obesity and BMI as a measure of general obesity. Studies by *Mukherjee et al (2008)* and *Daousi et al (2006)* indicate that central obesity is shown to be a strong risk factor for T2DM. With rapidly increasing prevalence of diabetes in India, it is of paramount importance to determine the prevalence of obesity and hypertension in these patients and treat it at the earliest by implementing suitable lifestyle measures. Thus, it becomes imperative to examine the prevalence of obesity and hypertension in patients with T2DM attending diabetes clinics.

## Material and methods:

The present hospital-based study was done in Amritsar on the newly diagnosed T2DM patients (diagnosed within the last 6 months). The patients were recruited from two hospitals (Dr. A.S. Multani clinic and Guru Nanak Dev Hospital) of Amritsar. The study was done on a total of 300 newly confirmed diabetic patients including 162 males and 138 females. Diagnosis of T2DM was based on reports of doctors on the criteria established by WHO (1999) i.e. fasting blood glucose $\geq110$ mg/dl. The present study was approved by ethical committee of Guru Nanak Dev University, Amritsar. An

informed consent was obtained from all the subjects after explaining the objectives of the study. During the data collection, personal interview was held with each subject using pretested questionnaire. For determining obesity four anthropometric measurements (Body weight, Body height, Waist circumference, and Hip circumference) were taken on each subject using standard methodology given by *Weiner and Lourie (1981)*. From weight and height measurements BMI was calculated and general obesity was assessed by using following BMI criteria of WHO (2000):

| BMI | CATEGORY |
|---|---|
| <18.5 kg/m2 | Underweight |
| 18.5-22.9 kg/m2 | Normal |
| 23-24.9 kg/m2 | Overweight |
| $\geq$25 kg/m2 | Obese |

The prevalence of abdominal obesity was assessed with the help of WC, WHR, WSR using following criteria:

| Category | Normal | | Obese | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| WC, cm *Snehalatha et al, (2003)* | <90 | <80 | $\geq$90 | $\geq$80 |
| WHR cm *Snehalatha et al, (2003)* | <0.88 | <0.81 | $\geq$0.88 | $\geq$0.81 |
| WSR, cm *Hsieh and Muto (2004)* | <0.5 | <0.5 | $\geq$0.5 | $\geq$0.5 |

Blood pressure of each subject was recorded in a sitting position by ascultatory method on the right arm using a mercury sphygmomanometer (Diamond Deluxe Blood Pressure apparatus, Pune, India). Before taking the measurement, the subject was seated at rest at least 10 minutes prior to measurements. Three blood pressure readings were recorded at more than one weak intervals and average

of three readings taken into account for determination of blood pressure reading. Hypertension was assessed using following "JNC VII" (2003) criteria:

|  | SBP (mm/Hg) | DBP (mm/Hg) |
|---|---|---|
| Normal | <120 | <80 |
| Pre-hypertensive | 120-139 | 80-89 |
| Hypertensive | ≥140 | ≥90 |

The whole data was entered into computer using MS-Excel program. The data was analyzed using Statistical Software for Social Sciences for Windows version 16.0 (SPSS Inc., Chicago, IL). The students 't'- test and 'chi' square tests were used to find out the statistical significance of the results.

## Results & Discussion

**Table 1: Anthropometric and Physiological variables of newly diagnosed diabetic patients.**

| Variables | Males Mean | SD | Females Mean | SD | 't' values |
|---|---|---|---|---|---|
| Age(yrs.) | 52.06 | 16.63 | 54.04 | 15.77 | 1.050 |
| Weight (kg) | 79.54 | 10.54 | 72.35 | 12.41 | 5.359** |
| Height(cm) | 175.0 | 6.141 | 160.0 | 6.462 | 20.254** |
| WC (cm) | 93.60 | 7.917 | 93.30 | 11.20 | 0.266 |
| HC (cm) | 99.63 | 8.02 | 100.0 | 11.57 | 0.496 |
| BMI (kg/m2) | 25.81 | 3.04 | 28.0 | 4.4 | 5.038** |
| WHR | 0.94 | 0.05 | 0.92 | 0.06 | 1.866 |
| WSR | 0.53 | 0.04 | 0.57 | 0.07 | 6.086** |
| SBP (mm/Hg) | 139.0 | 9.85 | 138.0 | 12.25 | 0.877 |
| DBP (mm/Hg) | 96.23 | 9.87 | 94.85 | 10.49 | 1.166 |
| PP (mm/Hg) | 43.67 | 7.24 | 43.98 | 8.98 | 0.328 |
| MAP(mm/Hg) | 125.0 | 9.24 | 109.0 | 10.43 | 13.77** |

*Significant at p<0.05, ** Significant at p<0.01*

Table 1 depicts the characteristics of the studied newly diagnosed T2DM subjects. Diabetic females were slightly older than males. Males had significantly higher weight and height values as compared to that of females while females

had slightly higher values of BMI and WSR as compared to males.

**Table 2: Percentage prevalence of obesity in newly diagnosed diabetic males.**

| | Variables | Under weight | Normal | Over weight | Obese % |
|---|---|---|---|---|---|
| **Males** | | | | | |
| Genera-lised obesity | BMI (kg/m²) | 0.61% (1) | 14.81 % (24) | 26.54 % (43) | 58.02 % (94) |
| | WC(cm) | - | 11.72 % (19) | - | 88.27 % (143) |
| Abdomi-nal obesity | WHR | - | 1.85% (3) | - | 98.14 % (159) |
| | WSR | - | 14.82 % (24) | - | 85.18 % (138) |
| **Females** | | | | | |
| Genera-lised obesity | BMI (kg/m²) | 0 (0) | 11.59 % (16) | 14.49 % (20) | 73.91 % (102) |
| | WC(cm) | - | 8.69% (12) | - | 91.3% (126) |
| Abdomi-nal obesity | WHR | - | 3.62% (5) | - | 96.3% (133) |
| | WSR | - | 9.42% (13) | - | 90.59 % (125) |

According to *WHO (2000),* criteria of BMI it was apparent from the Table 2 that the prevalence of obesity among newly diagnosed diabetic males and females was 58.02% and 73.91%, respectively. The prevalence of abdominal obesity according to WC in newly diagnosed diabetic males and females was 88.27% and 91.3%, while according to WHR was 98.14% and 96.3% and according to WSR was 85.18% and 90.5%, respectively. In case of males, only 11.27%, 14.82% and 14.81% subjects were normal according to WC, WSR and BMI, respectively, while in case of females, 8.69%, 9.42% and 11.59% were normal according to WC, WSR and BMI, respectively. It was quite interesting to note that only 1.85% diabetic males and 3.62% diabetic females were normal according to WHR.

115

**Table 3: Percentage prevalence of hypertension in newly diagnosed diabetic patients.**

| Category | Normotensive | Pre-hypertensive | Hypertensive |
|---|---|---|---|
| **Males** (n=162) | **0** (0) | **11.7%** (19) | **88.2%** (143) |
| **Females** (n=138) | **1.4%** (2) | **13.76%** (19) | **84.7%** (117) |
| **Total** (n=300) | **0.66%** (2) | **9.66%** (38) | **86.6%** (260) |

*Figures in parenthesis indicates number of subject*

Table 3 shows the prevalence of hypertension in diabetic patients. In the present study 86.6% of the diabetic patients were hypertensive according to "JNC VII" criteria (males: 88.2%, females: 84.7%). While 9.66% were in pre-hypertensive (males: 11.7%, females: 13.76%) category and only 0.66% were normotensive. The difference between the percentage prevalence of hypertension in diabetic males and females was statistically non-significant.

## Discussion

Diabetes Mellitus is a major public health problem which has become the leading cause of mortality and morbidity worldwide. Its prevalence is rising in the developing countries especially in India, in response to increasing prosperity and sedentary lifestyles. To the best of our knowledge, no similar study on prevalence of obesity and hypertension in newly diagnosed T2DM patients attending diabetic clinics was conducted in Amritsar (Punjab). BMI is the most widely used diagnostic tool to identify prevalence of obesity in epidemiological studies. The mean value of BMI of the diabetic females among the newly diagnosed diabetic patients was significantly higher than diabetic males (Table 1). In the present study, the prevalence of obesity (BMI ≥25) was 65.33% and the prevalence of obesity

(according to BMI) was more in females than in males. On the other hand, the abdominal obesity according to WC, WHR and WSR was present in 89.66%, 97.33% and 87.66% (Table 2). Results of the present study clearly depicted that majority of the diabetic patients were abdominally obese. Table 4 shows the comparative prevalence of obesity (according to BMI) in diabetic patients of various parts of India. This table shows that the prevalence of obesity was slightly higher in T2DM patients of Amritsar was slightly higher than the other parts of India. However, the prevalence of obesity reported in these studies was not strictly comparable because of the variation in criteria used, variation in age and socioeconomic status of the subjects.

**Table 4: Percentage prevalence of overweight and obesity in diabetic Indian patients.**

| Place and Area | Obesity criteria (BMI) kg/m2 | (n) | % Prevalence | | |
|---|---|---|---|---|---|
| | | | Men | Women | Total |
| Andhra Pradesh Dudekhula et al. (2012) | ≥ 25 | 140 | 50 | 47.5 | - |
| Ahmedabad Patel et al (2011a) | ≥ 25 | 709 | - | - | 62 |
| Manipal Kamath et al. (2011) | ≥ 25 | 446 | 40.9 | 58.8 | 48.4 |
| Gujarat Patel et al (2011b) | ≥ 25 | 622 | - | - | 68 |
| Bikaner Sankhla et al (2011) | ≥ 25 | 171 | - | - | 56.72 |
| South Asia Pandya et al (2011) | >25 Modified ATP III And NCEP | 350 | Urban-71 Rural-49 | Urban-88 Rural-80 | 70 |
| Udaipur Sharma and Jain(2009 | ≥ 25 | 60 | - | - | 46.66 |
| North india | >25 | 241 | - | - | 45.22 |
| Chennai | ≥ 25 | 124 | - | - | 54.3 |
| Kanchipuram | | 95 | - | - | 48.5 |
| Panruti | | 33 | - | - | 33.0 |
| South India Ramachandran et al (2008) | | 252 | - | - | 48.1 |

86.6% of newly diagnosed T2DM patients were hypertensive while 9.66% were pre-hypertensive and only 0.66%

were normotensive (Table 3). This is apparent from present results that majority of T2DM patients were hypertensive. Table 5, depicts the comparative prevalence of hypertension in some diabetic patients of India. It is evident from this table that the prevalence of hypertension among diabetic patients varies from 33% to 70%. This proves that, the prevalence of hypertension was quite higher among diabetic patients of Amritsar than other studies conducted in India which may be due to the difference in the dietary habits and lifestyle changes. This proves that prevalence of figures of obesity and hypertension among newly diagnosed T2DM are alarming so, these patients need counseling for lifestyle modification, which mainly include physical activity and nutrition education.

**Table 5: Percentage prevalence of hypertension in some Indian diabetic patients**

| Place and Area | n | Criteria | % Prevalence | | |
|---|---|---|---|---|---|
| **Jodhpur** *Purvi Purohit, (2012)* | **180** | ≥130/80 | **40.2** | **39.8** | **-** |
| **Andhra Pradesh** *Dudekula et al (2012)* | **140** | ≥140/80 | **-** | **-** | **61** |
| **Ahmedabad** *Patel et al (2011a)* | **709** | >130/80 | **-** | **-** | **45.1** |
| **Gujarat** *Patel et al (2011b)* | **622** | >130/80 | **-** | **-** | **47** |
| **Chennai** *Ramachandran et al (2008)* | **141** | | | | **61.8** |
| **Kanchipuram** | **104** | | | | **53.1** |
| **Panruti** | **56** | ≥130/85 | | | **56.0** |
| **South India** | **301** | | | | **57.4** |

## References:

Al-Johari, A.A. 2011. Prospective incidence study of diabetes mellitus in morbidly obese Saudi patients. *Webmed Central General Medicine*, **2(5):** WMC001927.

Dudekhula, Basha, Anwar, Naik, Lalu, Jesoth, and Reddy, KSN. 2012. Correlation between blood sugars and body maas index with blood pressure among the type 2 diabetic adults. *Asian J Exp. Biol. Sci.*, **3(2):** 378-383.

Arner, E, Westermark, PO, Spalding, KL, Britton, T, Ryden, M, Frisen, J, et al, 2010. Adipocyte Turnover: Relevance to Human Adipose Tissue Morphology. *Diabetes,* **59:**105-9.

Kamath, Ashwin, Shivprakash, G., Adhikari, Prabha. 2011. Body mass index and waist circumference in Type II diabetes mellitus patients attending a diabetes clinic. *Int J Biol Med Res.*, **2(3):** 636-638.

Ramachandran, A., Mary, S., Sathish, C.K., Selvam, S., Catherin, A., Seeli, Muruganandnam M. et al. 2008. Population-based study of quality of diabetes care in Southern India. *JAPI*, **56:** 513-516.

C Daousi, C., Casson, I.F., Gill, G.V., MacFarlane, I.A., Wilding, J.P.H. and Pinkney, J.H. 2006. Prevalence of obesity in type 2 diabetes patients in secondary care: association with cardiovascular risk factors. *Postgrad. Med. J.,* **82:** 280-284.

Pandya, H., Lakhani, J.D., Patel, N. 2011. Obesity is becoming synonym for diabetes in rural areas of India also an alarming situation. *Int. J. Biol. Med. Res.,* **2(2):** 556-560.

Hossain, P, Kawar, B., El-Nahas, M., 2007. Obesity and diabetes in the developing world: a growing challenge. *N. Engl. J. Med.,* **356(3):** 213-215.

Hsieh, S.D., Muto, T. 2005. The superiority of waist-to-height ratio as an anthropometric index to evaluate clustering of coronary risk factors among non-obese men and women. *Prev. Med.,* **40:** 216-20.

Hasan, I., Shabnam, K. 2012. Prevalence of diabetes mellitus and obesity among population of Sultanpur Kunhari and its surrounding area, Haridwar Uttarakhand. *Int. Res. J. Pharmacy*, **3(2).** 226-229.

JNC VII. 2004. The seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure. U.S. Department of Health and Human Services, National Institutes of Health National Heart, Lung, and Blood Institute National High Blood Pressure Education Program, NIH Publication No. 04-5230, August 2004

Klein, R, Klein, BEK, Lee, KE, Cruickshanks, KJ, Moss, SE. 1996. The incidence of hypertension in insulin dependent diabetes. *Arch. Intern. Med.,* **156:** 622-627.

Mugharbel, Kholood, M., Mowaffaq, Al-Mansouri, A. 2003. Prevalence of obesity among type II diabetic patients in Al-Khobar primary health care centers. *J. Family & Comm. Med.*, **10(2).**

Narkiewicz, Krzysztof. 2006. Obesity and hypertension- the issue is more complex than we thought. *Nephrol. Dial. Transplant*, **21:** 264-267.

Mukherjee, S.K., Mukhopadhyay, S.P. et al. 2008. Prevalence of diabetes andimpaired fasting glucose in a selected population with special reference toinfluence of family history and anthropometric measurements – The Kolkata policeman study. *JAPI*, **56:** 841-844.

Waghmare, L., Shrivastav, T., Khatib, N., Jain, A., Zodpey, S., Gaidhane, A., Zahiruddin. M., Syed, Q. 2012. The cross sectional study of anthropometric parameters in young healthy individuals having parental history of hypertension. *Int. J. Med. Public health***, 2(1):** 38-43.

Smith, W.C.S., Lee, A.J., Crombie, T.K., Tunstall-Pedoe, H. Control of blood pressure in Scotland: the rule of halves. *Brit. Med. J.,* 1990. **300:** 981-983.

Saxena, M., Aggarwal, C.G., Hemant, S., Gautam, B., K. and Banerjee, M. 2009. Overt diabetic complications in obese type ii diabetes mellitus patients from North India. *Arc. Apl. Sci. Res.*, **1(2):** 57-66.

Sankhla, M., Mathur, K., Rathore, J. S., Gehlot, S., Aggarwal, R.P. 2011. Obesity and abdominal adiposity in diabetic dyslipidemia. *Ind. J. Clin. Biochem*., **26(4):** 426-427.

Patel, M., Patel, I., Patel, M., Yash, M., Shah, P., Rathi, S. K. 2011. Profile of the subjects with Diabetes: A hospital based observational study from Ahmedabad, Western India. *Electronic Physician*, Iran.

Patel, M., Patel, I., M., Yash, Patel, M., and Rathi Suresh, K. 2011. A hospital based observational study of Type II diabetic subjects from Gujarat, India. *J. Health Popul. Nutr*., **29(3):** 265-272.

Hossain, Mohammad, Salim, Rahaman, Zahedur, Banik, Sujan, Sarwar, Shahid, Yokota, Kazushige. 2012. Prevalence of the metabolic syndrome in diabetic patients living in a coastal region of Bangladesh.*. IJPSR,* **3(8):** 2633-263.

Purohit, P. 2012. A cross sectional study of type II diabetic females at a higher CVD risk owing to a strong correlation of systolic hypertension to CVD risk factors. *Int J Biol Med Res.*, **3(3):** 1905-1909.

Pradeepa, Rajendra, Prabhakaran, Dorairaj and Viswanathan, Mohan. 2012. Emerging economies and diabetes and cardiovascular disease. *Diabetes Technology & Therapeutics*, **14(1)**: S59-S67.

Snehalatha, C., Vishwanathan, V., Ramachandran, A. 2003. Cut off values for normal anthropometric variables in Asian Indian adults. *Diabetes Care***, 26:** 1380-1384.

Sharma, Shilpi and Jain, Shashi. 2009. Prevalence of obesity among type 2 diabetics. *J. Hum. Ecol.*, **25(1):** 31-35.

Weiner, J.S. and Lourie, J.A. 1981. Practical Human Biology. *Academic Press*, London.

World Health Organisation. 1999. Obesity preventing and managing the global epidemic, WHO expert committee. *WHO Tech Rep Ser*., **893:** 253.

World Health Organisation. 2000. Obesity: Preventing and managing the global epidemic. *WHO Tech Rep Ser.,* **894:** 1-253.