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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/14933
DOI URL: http://dx.doi.org/10.21474/IJAR01/14933

*RESEARCH ARTICLE*

# BMI COMPARISON IN DIABETIC HYPERTENSIVES VS DIABETIC NORMOTENSIVES

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## Manuscript Info

***Manuscript History***
Received: 21 April 2022
Final Accepted: 24 May 2022
Published: June 2022

***Key words:-***
Type 2 Diabetes Mellitus, BMI, High Blood Pressure

## Abstract

**Background:** Increased body fat levels are associated with an increased risk of metabolic disorders such as type 2 diabetes, high blood pressure, and dyslipidemia. Recommendations for treating obesity are currently based on BMI conditions, with variable cut-off points based on the presence or absence of obesity-related disease. In addition, many people with type 2 diabetes are either overweight or obese. Although these basic clinical ideas may be well-received by many physicians and researchers, and are thought to be easily found in medical literature, the authors are unaware of any previous reports summarizing data on the important relationship between BMI and type 2 diabetes in a broad way.

**Aim:** To compare BMI in diabetic hypertensives and diabetic normotensives.

**Methods**: A prospective screening study was conducted in 200 studies aged 40-60 from November 2019 to October 2020 on patients with type 2 diabetes (both old and new cases) with high blood pressure without having any complications related to diabetes and age and gender-matched sex without high blood pressure. Results: The BMI average in group 1 was 27.98 ± 4.60 kg / m² and that in group 2 was 25.73 ± 3.02 kg / m², the difference between the two groups was statistically significant (p <0.0001). The average systolic and diastolic blood pressure in Group 1 was 127.64 ± 13.41 and 86.20 ± 7.06 mmHg and for Group 2 blood it was 118 ± 10.80 and 77.52 ± 7.87 mmHg, the difference between the two groups was significant (010.0 in high numbers). Means Fasting Blood Group 1 blood sugar was 177.91 ± 62.52 mg / dl and Group 2 blood was 197.80 ± 74.75 mg / dl, the difference being statistically significant (p = 0.043). Conclusion: The BMI ratio in patients with diabetes and high blood pressure was significantly higher than in diabetes alone, indicating that high BMI is a risk factor for the development of macrovascular disorders and thus a sign of illness and death.



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## Introduction:-

Diabetes mellitus (DM) refers to a group of common metabolic disorders associated with the phenotype of hyperglycemia. Several different types of DM are caused by complex interactions of genes and environmental factors. With the increase in incidents worldwide, DM will likely be the leading cause of illness and death in the future. [1]

Increased body weight and obesity are the most common health problems related to lifestyle. Excess weight and obesity are a risk factor for the development of chronic diseases such as heart disease, respiratory disease, insulin-dependent diabetes mellitus or Type 2 diabetes Mellitus (T2DM), high blood pressure and cancer. Obesity is defined as a condition characterized by abnormal or excessive accumulation of fat in the adipose tissue in the body due to an imbalance of energy leading to an increase in energy retention, especially as fat. At present, over one billion adults worldwide are obese and at least 300 million are clinically obese. As of 2014, the World Health Organization (WHO), Global Health Observatory (GHO), United States (US) have the highest prevalence of obesity and obesity (62% overweight for both sexes, and 26% for obesity), while South Africa East Asia (14% obese for both sexes and 3% for obese) has a low prevalence. India has the third highest number of overweight and obese people (11% of young people, and 20% of all adults) behind the US and China. [2]

## Methods:-

The current prospective study was conducted in the postgraduate department of Physiology, Government Medical College and Hospital- Jammu, from November 2019 to October 2020, in 200 subjects aged 40-60.

Volunteers were selected from the Government Medical College and Hospital, Jammu and associated hospitals. Studies have been performed on patients with type 2 diabetes (both old and new) who have high blood pressure without having any complications associated with diabetes and age-related diabetics without high blood pressure. The 200 subjects were selected in the form of random samples. After detailed explaining the purpose and method of the study, all subjects who were eligible were asked to participate in the study.

**Data Source**

(a) The studies were performed on patients with type 2 diabetes with high blood pressure (Both external patient and patient).
(b) Controls covering subjects diagnosed with type 2 diabetes without related high blood pressure.

A detailed history was performed and clinical trials were conducted in the subjects as per proforma. Height and weight were measured and body mass index (BMI) was calculated. Measurements of blood sugar and glycated hemoglobin (HbA1c) were performed in both groups. Laboratory tests were performed on an automatic analyzer of prepared methods.

Body mass index (BMI): calculated with the Quetelet index
i.e.
BMI = weight (kg) / height ($m^2$) **(WTRS, 1995)** [3]

**Statistical Analysis:**

Data were analyzed using Microsoft Excel software and a version of SPSS 20.0 for windows. Reported data were as mean ± standard deviations and estimates considered appropriate for volume and quality variables respectively. The statistical difference in mean value was assessed using the unpaired‘t’ test. The ANOVA variant was also developed to assess statistical significance in more than two groups. A p value of $<0.05$ was considered statistically significant. All reported p values have two tails.

**Funding:**
Nil.

**Conflict of interest:**
Nil.

## Results:-

After explaining the purpose and method of the study, all studies that were found to be relevant have been requested to participate in the study. The current research work was aimed at comparing BMI levels in type 2 diabetics with high blood pressure and type 2 diabetics without high blood pressure, to compare abnormalities in these parameters in both groups.

The demographic profile of the study population in given in (table).

**Table 1:-** Patient demographic characteristics:

| Parameters | Group 1 | Group 2 | P value |
|---|---|---|---|
| Age (years) | 53.65±6.14 | 49.49±6.86 | <0.0001* |
| Height (mts) | 1.61±0.10 | 1.63±0.09 | 1.102 |
| Weight (kgs) | 72.58±12.12 | 68.38±9.78 | 0.008 |
| Sex M/F | 39/61 | 52/48 | 0.064 |

Values in the table are mean ± SD or absolute numbers (percentage). SD = Standard deviation, * statically significant

The median systolic and diastolic blood pressure of Group 1 was 127.64 ± 13.41 and 86.20 ± 7.06 mmHg and that of Group 2 was 118 ± 10.80 and 77.52 ± 7.87 mmHg, the difference between the two main groups highly significant (p<0.0001) (table 2).

**Table 2:-** Group comparison for blood pressure.

| **Blood pressure (mmHg)** | **Mean ± Standard deviation** | | **p-value** |
|---|---|---|---|
| | **Group 1** | **Group 2** | |
| Systolic blood pressure | 127.64 ± 13.41 | 118.19 ± 10.80 | <0.0001 |
| Diastolic blood pressure | 86.20 ± 7.06 | 77.52 ± 7.87 | <0.0001 |

The average duration of type 2 diabetes mellitus ± normal deviation in group 1 was 5.90 ± 4.48 years compared to the median age of 4.85 ± 3.63 in the group 2, the statistical difference (p = 0.070) (fig. 1 )

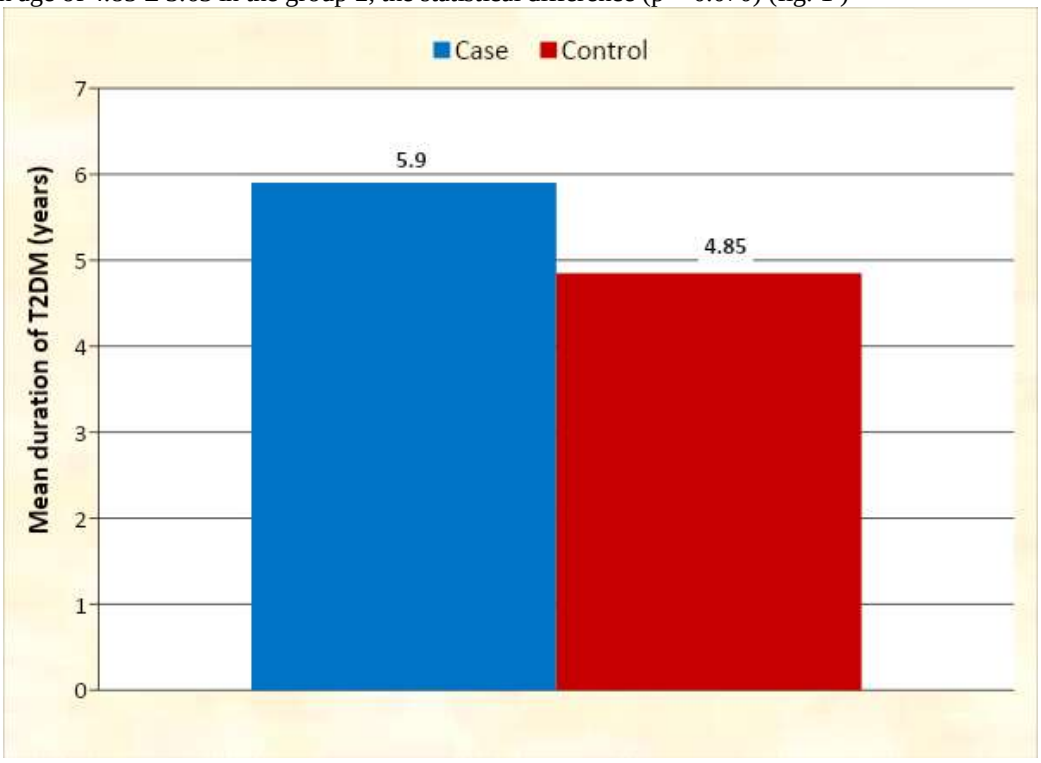


**Fig 1:-**

Mean Fasting Blood Group 1 blood sugar was 197.80 ± 74.75 mg / dl, and Group 2 blood was 177.91 ± 62.52 mg / dl, the difference being statistically significant (p = 0.043). The exact HbA1c of Group 1 was 9.15 ± 2.18% and that of Group 2 was 9.15 ± 2.18%, not statistically significant (p = 0.179) (table 3).

**Table 3:-** Group comparison for blood sugar and HbA1C.

| **Variables** | **Mean ± Standard deviation** | | **p-value** | |
|---|---|---|---|---|
| | **Group 1** | **Group 2** | | |
| Fasting blood sugar (mg/dl) | 177.91 ± 62.52 | 197.80 ± 74.75 | 0.043 | |
| HbA1c (%) | 9.15 ± 2.18 | 8.72 ± 2.33 | 0.179 | |

In Group 1, BMI ± refers to the standard deviation of subjects 40-45 years of age 27.96 ± 5.64 kg / m² and that of group 2 was 25.50 ± 2.61 kg / m², the difference between the two groups is statistically significant (p = 0.037).

In Group 1, BMI ± refers to the standard deviation of subjects 46-50 years of age 30.33 ± 4.71 kg / m² and that of group 2 was 25.51 ± 3.91 kg / m², the difference between the two groups is statistically significant (p = 0.001).

In Group 1, BMI ± refers to the standard deviation of subjects aged 51-55 years. 26.95 ± 4.53 kg / m² and that of group 2 was 26.12 ± 2.19 kg / m², the difference between the two groups was not statistically significant (p = 0.508).

In Group 1, BMI ± refers to the standard deviation of subjects 56-60 years of age 27.40 ± 4.03 kg / m² and that of group 2 was 26.10 ± 3.19 kg / m², the difference between the two groups was not statistically significant (p = 0.188).

| **Age distribution (years)** | **Body mass index (kg/m$^2$) (Mean ± SD)** | | **p-value** |
|---|---|---|---|
| | **Group 1** | **Group 2** | |
| 40-45 | 27.96 ± 5.64 | 25.50 ± 2.61 | 0.037 |
| 46-50 | 30.33 ± 4.71 | 25.51 ± 3.91 | 0.001 |
| 51-55 | 26.95 ± 4.53 | 26.12 ± 2.19 | 0.508 |
| 56-60 | 27.40 ± 4.03 | 26.10 ± 3.19 | 0.188 |

## Discussion:-

Diabetes mellitus manifests in two forms: Type-1 and Type-2. Type-1 or insulin dependent diabetes mellitus (IDDM) is due to insulin deficiency caused by immune destruction of B cells of islet of pancreas. Type-2 diabetes was previously referred to as non-insulin dependent diabetes or adult onset diabetes. It is a term used for individuals who have insulin resistance and usually have relative insulin deficiency. At least initially and often throughout their life time, these individuals do not need insulin treatment to survive. Both the types of diabetes mellitus affect various organs of our body and major side effects of diabetes mellitus are due to its microangiopathic and macroangiopathic complications, which effect eyes, kidneys, nerves, heart, blood vessels and the lungs.**[4]**

Cardiovascular disease is increased in type 2 diabetes mellitus subjects due to a complex combination of various traditional and non-traditional risk factors that have an important role to play in the beginning and the evolution of atherosclerosis over its long natural history from endothelial function to clinical events **[5].**

Hypertension is present in more than 50% of patients with diabetes mellitus and contributes significantly to both microvascular and macrovascular disease in type-2 diabetes mellitus. Indeed the risk for cardiovascular disease is four fold higher in patients with both diabetes mellitus and hypertension as compared to normotensive non diabetic controls **[6].**

In the current study, age in group 1 was 53.65 ± 6.14 years and group 2 was 49.49 ± 6.86 years, the difference being statistically significant (p <0.0001).

Examination of the physical parameter of the average age of the current study agrees with the observations made by **Han TS et al., (1998) [7] and Sosenko JM et al., (1993) [8]** who reported that as age in population development, the number of people with diabetes and high blood pressure is growing.

**Height**
The mean height in group 1 was 1.61 ± 0.10 meters and that in group 2 was 1.63 ± 0.09 meters, the statistical difference is not significant (p <0.102).

Examination of the physical parameter of the current study-length scale is consistent with observations made by **Looker HC et al., (2001) [9]** who reported that there was no significant difference in height between subjects of diabetes mellitus with hypertension and diabetic patients only.

**Weight**
In our study the BMI average in group 1 was 27.98 ± 4.60 kg / m² and in the 2nd group it was 25.73 ± 3.02 kg / m², the difference between the two groups was statistically significant (p <0.0001).

A look at the physical parameters of the BMI of the current study agrees with the observations made by **Han TS et al., (1998)**[7] who reported that hypertension of diabetes has a higher BMI.

**Yanovski SZ and Yanovski JA (2011) [11]** reported significant differences in anthropometric data between diabetic hypertension and control subjects. The study also agrees with the current study.

**Flegal KM et al., (2010) [12]** also reported significant differences in anthropometric data between diabetic hypertensives and control subjects.

**The observations presented by Nam GE et al., (2020) [13]** also showed significant differences in anthropometry in diabetic hypertension and controls.

What we have observed is consistent with comments by **Kopelman P (2007) [14]** who reported that anthropometric measurements were found to be more important in type 2 diabetes hypertension than in the control group.

Similar results were presented by **Eknoyan G (2008) [15**] who observed significant differences in anthropometric data.

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