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International Journal of Current Research
Vol. 6, Issue, 07, pp.7522-7523, July, 2014

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

DIFFERENTIAL INFLUENCE OF GENDER ON BODY MASS INDEX IN HEALTHY SUBJECTS AND SUBJECTS WITH TYPE 2 DIABETES MELLITUS

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ARTICLE INFO

Article History:
Received 15th April, 2014
Received in revised form
04th May, 2014
Accepted 06th June, 2014
Published online 20th July, 2014

Key words:
Body Mass Index,
Males,
Females,
Type 2 Diabetics,
Healthy Subjects.

ABSTRACT

Introduction: The research in the last decade emphasizes the need for uncovering the gender differences in vulnerability to and the impact of, specific health conditions. Therefore this study was undertaken to evaluate sex difference in body mass index (BMI) an indicator of obesity in healthy subjects and subjects with type 2 diabetes mellitus.

Materials and Methods: BMI was calculated in male and female healthy subjects (n= 87 and 54 respectively) and in male and female diabetics (n= 115 and 91 respectively) BMI was compared among the male and female healthy and diabetic subjects by employing Kruskal-Wallis test followed by multiple comparison by Dunn test. $P < 0.05$ was taken as statistically significant.

Result: In healthy subjects BMI was significantly higher in males compared to females ($P < 0.05$). In type 2 diabetics BMI was significantly higher in females compared to males ($P< 0.001$). BMI of female diabetics was significantly higher compared to healthy females ($P<0.001$). There was no significant difference in BMI between healthy males and type 2 diabetic males.

Conclusion: There is a differential influence of sex on BMI in health and in type 2 diabetes. In healthy subjects BMI is higher in males and in type 2 diabetics, females have higher BMI compared to their counterparts.

INTRODUCTION

Cardiovascular disease (CVD) is one of the leading causes of mortality (WHO 2008). Obesity, hypertension and diabetes mellitus are the known risk factors of cardiovascular disease. (Aaron *et al.,* 1998) BMI is positively and independently associated with morbidity and mortality from hypertension, CVD, type II diabetes mellitus, and other chronic diseases (Pi-Sunyer 1993). Body mass index (BMI), calculated as weight in kg/height in meters squared, is most widely used to estimate the prevalence of obesity or underweight within a population. Many different types of studies such as metabolic, nutritional and others have extensively used BMI as an indicator of body fat content in human subjects. (Muralidhara 2008) The research in the last decade, emphasizes the need for uncovering the gender differences in vulnerability to and the impact of, specific health conditions. (Miller 2001) Therefore this study was undertaken to evaluate sex difference on BMI in healthy subjects and subjects with type 2 diabetes mellitus.

MATERIALS AND METHODS

A total of 141 healthy subjects (87 males and 54 females) and 206 type 2 diabetics were studied (115 males and 91 females). Males and females of healthy subjects and diabetics were age matched. They were unselected with regard to blood pressure and BMI. In all the subjects height and weight was measured accurately. BMI was then calculated as weight in kg/height in meters squared. Systolic and diastolic blood pressure was measured using sphygmomanometer in sitting position. Two readings were taken 5 minutes apart in the sitting position. The mean of the two was recorded as blood pressure.

Statistical analysis

Kruskal-Wallis test was employed to find any significant difference in measured parameters among male and female healthy subjects and diabetic subjects. Multiple comparisons were done using Dunn test. Man Whitney test was used to compare duration of diabetes between male and female type 2 diabetics. $P < 0.05$ was taken as statistically significant.

RESULT

Data is presented as mean ±SD. Data on measured parameters of healthy males and females are presented in Table 1 and of diabetic subjects are presented in Table 2. Age of healthy males and female subjects and of male and female diabetics did not differ significantly (Kruskal-Wallis Statistic (KW): 7.720 $p = 0.052$). BMI of male and female healthy subjects and of diabetics was significantly different (KW) = 30.545, p

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<0.0001). BMI of males was significantly higher compared to females in healthy subjects (Mean rank difference = 50.072, P<0.05). BMI of males was significantly lower compared to females in diabetics (Mean rank difference = 56.249, P<0.001).

Table 1. Data on body mass index and blood pressure in male and female healthy subjects

Variables	Males (n = 87)	Females (n = 54)
Age (years)	53.91± 8.6 ^{NS}	51.85 ± 6.50
Body mass index (kg/m^2)	23.1± 2.26 *	21.54± 2.11
Systolic blood pressure (mmHg)	124.66 ± 9.15^{NS}	119.40 ± 7.24
Diastolic blood pressure (mmHg)	81.01± 3.12^{NS}	80.46 ± 2.55

*P<0.05 compared to females

Table 2. Data on body mass index and blood pressure in male and female type 2 diabetics (Values are mean ± SD)

variables	Diabetic males (n = 115)	Diabetic females (n = 91)
Age (years)	56.21± 8.35	54.87± 8.15 ^{NS}
Body mass index (kg/m^2)	22.56± 2.10	24.26 ±2.50**
Systolic blood pressure (mmHg)	139.46± 14.87	141.13± 17.47 ^{NS}
Diastolic blood pressure (mmHg)	85.53± 7.28	86.26 ± 7.82 ^{NS}
Duration of diabetes (years)	8.90 ± 6.30	6.92 ± 4.75 ^{NS}

** P < 0.001 compared to diabetic males

Female diabetics had significantly higher BMI compared to female healthy subjects (Mean rank difference = 89.778, P<0.001). BMI of healthy male subjects did not differ significantly compared to male diabetics (Mean rank difference = 16.544, p > 0.05). Systolic blood pressure of male and female subjects of healthy subjects and diabetics was significantly different (K KW = 77.435, p < 0.0001) Systolic blood pressure of male and female diabetics subjects was significantly higher compared to healthy male and female subjects (Mean rank difference = 77.685, P<0.001; mean rank difference = 115.16, p<0.001 respectively). In diabetics there was no significant difference in systolic blood pressure between male and females (Mean rank difference = 0.6765, p > 0.05). In healthy subjects there was no significant difference in systolic blood pressure between males and females (mean rank difference = 36.798, p >0.05). Diastolic blood pressure of male and females in healthy subjects and diabetics was significantly different (KW= 40.304; p < 0.0001). Diastolic blood pressure of male and female diabetics was significantly higher compared to male and female healthy subjects (mean rank difference -58.805, P<0.001; -72.540, P<0.001 respectively) Diastolic blood pressure of male and female healthy subjects did not differ significantly (Mean rank difference = 9.883 P > 0.05).

DISCUSSION

We evaluated the BMI of males and females of healthy subjects and subjects with type 2 diabetes mellitus. The results of the present study demonstrate that there is certain difference in influence of sex on BMI in diabetic subjects in relation to healthy subjects. In the present study in healthy subjects BMI was significantly higher in males compared to females. The BMI is widely used as a surrogate measure of overall adiposity because of its simplicity and high correlation with percent body fat. (Norgan and Ferro-Luzzi 1982; Gallagher *et al.,* 1996) Thus it could be said that in healthy people overall adiposity is greater in males compared to females. Significant difference observed in BMI between males and females emphasizes the need to investigate men and women separately when studying obesity index such as BMI. Reports of previous studies on obesity in type 2 diabetics are not consistent. Many studies have reported associations between body mass index (BMI; in kg/m2) and type 2 diabetes in men (Field *et al.,* 2001; Wannamethee *et al.,* 2005) and women (Resnick *et al.,* 2000; Colditz *et al.,* 1995; Carey *et al.,* 1997). However our study finding that is female diabetics having higher BMI compared to healthy female subjects but not male diabetics compared to healthy males suggests that influence of diabetes mellitus on overall obesity is higher in females.

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