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PREVALENCE OF METABOLIC SYNDROME IN TYPEII DIABETES MELLITUS

Endocrinology

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KEYWORDS

INTRODUCTION

Metabolic syndrome is being increasingly recognized as a worldwide epidemic and a major risk factor for CVD and other vascular events like stroke. Since last few decades, the global impact of infectious disease is decreasing while the global burden of chronic diseases (e.g. CVD and Diabetes) is on the rise.(1)The metabolic syndrome is defined as a clustering of key cardiovascular risk factors, namely, abdominal obesity, dyslipidemia, hyperglycemia and hypertension in a single individual(2). **Gerald Reaven** introduced the concept of the syndrome in 1988. Afterwards this constellation of cardiovascular disease (CVD) risk factors has been given a number of names, such as Syndrome X, dysmetabolic syndrome, insulin resistance syndrome and deadly quartet (3,4).However, till today its' observational and epidemiological investigation has long been prevented by the absence of internationally accepted criteria for its diagnosis. To defeat this problem, in 1998, Alberti and Zimmet (1998) proposed for the first time a more unified descriptive "definition" for the diagnosis of metabolic syndrome which they called as World Health Organization (WHO) criteria. Besides, the WHO criterion has not been consistently used because of the requirement to measure serum insulin and urinary microalbumin. This problem is overcome by the Third Report of the National Cholesterol Education Program (NCEP) the Adult Treatment Panel III (ATP III) in 2001. This definition uses only simple clinical measurements of waist circumference (WC), fasting plasma glucose (PG), triglyceride (TG) and high density lipoprotein cholesterol (HDL-C) levels as well as blood pressure (BP) (NCEP, 2001). The ATP III criteria is more practical and found to be a better predictor of coronary heart disease (CHD) risk in the US population (5). Unlike WHO criteria (3) microalbuminurea is not required for ATP III criteria. Recently the ATP III definitions for MetS were renewed in which the new cut-off waist circumference for the Asia and Pacific Region and new cut-off for fasting glucose was introduced (6).Recently, International Diabetes Federation (IDF) proposed a new world wide definition of the metabolic syndrome (International Diabetes Federation 2005). The above three definitions are the most popular and commonly used for the diagnosis of Metabolic syndrome (7). The main focus of this definition is central obesity defined by waist circumference and has specific cut-off value for different ethnic populations as a mandatory component in MetS definition. Besides, data on the agreement between the definitions of MetS (WHO, IDF and ATP III) in T2DM population is even more diverse, which make the estimation of MetS difficult to those prognosis the T2DM for risk of cardiovascular disease. The incidence and prevalence of cardiovascular diseases (CVD) is rapidly increasing in india and worldwide. By 2020, CVD will be the largest cause of disability and death in India(8,9) The Metabolic syndrome is a constellation of risk factors for atherosclerotic cardiovascular disease (ASCVD). Insulin resistance has been postulated as the key factor along with adiposity for development of these major CVD.

Although different terms have been used for the insulin resistance syndrome or syndrome X, the term Metabolic syndrome was coined by Adult Treatment Panel III- National Cholesterol Education Program (ATP III- NCEP) to use a common definition in global context(10).

NCEP: ATP III 2001 criteria for the metabolic syndrome modified for asian population

Three or more of the following

- Central obesity: waist circumference >90 (males), >80cm (females).
- Hypertriglyceridemia: triglyceride level ≥150mg/dl or specific medication.
- Low HDL cholesterol: <40mg/dl for men and <50 mg/dl for women or specific medication.
- Hypertension: blood pressure >130mmHg systolic or > 85mmHg diastolic or specific medication.
- Fasting plasma glucose level: ≥100 mg/dl or specific medication or previously diagnosed type 2 diabetes.

Metabolic syndrome increases the risk factor of developing diabetes and/or CVD by 30%-40% within 20 years, depending upon the number of risk factors present(11).Various studies have shown high prevalence of Metabolic syndrome in South Asians including India, probably due to high level of insulin resistance among them(12)

Aims and objectives

The aim of the present study was to determine the prevalence of metabolic syndrome in patients of type II diabetes mellitus attending medicine opd of SGT medical college Gurgaon.

Methodology

A total of 100 patients of type II diabetes who were willing to take part in the study and who had given informed written consent were randomly selected and recruited. Information about subject's age, sex, monthly income, life style, family history of diabetes and other diseases/disorders were recorded. Height, weight and waist circumferences were measured with the subject barefooted and lightly dressed. The abdominal circumference (waist) was measured at the end of expiration. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. Blood pressure was measured with special precaution individuals were requested to take 10 min rest at sitting position before measuring the BP. Blood pressure was measured by standardized protocols, and hypertension was defined based on the criteria of the Seventh Report of the Joint National Committee guidelines. According to this protocol, systolic and/or diastolic blood pressure ≥130/85 mmHg and/or the current use of antihypertensive medication in diabetes diagnosed as hypertension. Before registering for the study written consent was obtained from each participant

Blood sample (5ml) was collected from each subject. Plasma was separated by centrifuging blood and analyzed for fasting blood glucose,total cholesterol triglycerides and HDL cholesterol were estimated by CHOD-PAP (13), triglycerides (14) and HDL-Cholesterol (15) was estimated by spectrophotometric assays employing commercially available kits. LDL and VLDL were calculated from Freidewald's formula.

Statistical Analysis

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as percentages. Frequency distribution tables, bar and pie charts were used for data presentation. Chi-square test or Fisher's exact test, whichever appropriate, was used to determine association between various categorical variables. P-value less than 0.05 was considered statistically significant. All P-values were two tailed.

Results

A total of 100 patients of type 2 diabetic were recruited, with 57 male(57%)and 43 females (43%). Table 1 is showing the different clinical parameters among male and female groups.The mean age of the participant was 53 years and the mean duration of diabetes was 5.3years with (P≤0.05) significant difference between male and female. When comparison was made between male and female, fasting blood glucose, weight, height, systolic as well as diastolic blood pressure were observed to be significant(P<0.001).

Table 1 showing various parameters of study group with type2 diabetes

Table 1 Parameters of study group with type II diabetes (n=100)

Parameter	Males (n=57)	Females (n=43)	Difference(95%CI) pvalue
Age (years)	56±8.5	54±7.0	2(.388,3.5)*
Diabetes duration (yrs)	6±3	5.8±3	0.2(0.0182,1.60)*
Blood sugarF(mg/dl)	142.7±55	157±58.6	-15(-30.8,-8.5)**
P.P (mg/dl)	209±55	221±79	-12(-25.02,2.03)
Waist Cir. (Inches)	39±16.4	38.4±20	1.6(-1.68,4.86)
Systolic BP (mmHg)	138.6±20	132.7±18.5	5.1(2.1,7.8)**
Diastolic BP (mmhg)	82.8±12	85.2±11.1	2.5(.76,4.4)*
Triglycerides mg/dl	159.3±79	151.3±61	-4.3(-16.8,8.8)
HDL-C(mg/dl)	42.6±20	44.7±18.2	1.1(-4.6,2.4)
Height (cms)	165.5±7.8	153.3±7.5	11.7(10.3,13.08)**
Weight (kgs)	67.8±10.8	62±11.1	5.8(4.5,8.4)**

Data tabulated as Mean ±SD, *P< .05, **P< .001. Difference is the difference in the mean and percentage of the variable between males and females.

Metabolic syndrome was diagnosed in 46(46%) [95%CI: 42.31-49.69]participants using the NCEP-ATPIII criteria . The prevalence of MetS among male and female were (44% vs 59.1%),The prevalence of metabolic syndrome was found to be highest in age group of 50-59 years with 39%. It was also observed that (60-69) years and (40-49) years have almost same prevalence of metabolic syndrome. Lowest prevalence was observed in age group of (30-39) years of (5%).

The clinical data among two groups MetS and Non MetS of type 2 diabetes was also compared in our study population, taking together male and female, waist circumference, blood pressure (systolic as well as diastolic pressure), triglyceride & HDL-C were found to be Significant (P≤0.001) in metabolic syndrome group compared with non metabolic syndrome.we also observed an association of MetS with type 2 diabetes characterized by significant elevated level of triglyceride, central obesity, fasting blood glucose.shown in tables 2 and 3.

Table 2. Comparing the clinical data among two groups (Metabolic and Non Metabolic) of type 2 diabetic subjects in males.

Table2 showing comparison between metabolic and non metabolic group in males n=57

Parameter	Subjects with metabolic syndrome n1 = 25	Subjects without metabolic syndrome n2= 33	Significance
Age (year)	56±8.5	53±21	p=0.696
Waist Circumference (Inches)	39.±16.4	35.4±3.2	p=<0.001
SBP (mmHg)	138.6±20	122.4±12	p=<0.001
DBP (mmHg)	82.8±12	73.32±10	p=<0.001
Diabetes duration yrs	6±3	5.7±4	p=0.696
Triglyceride (mg/dl)	159.3±79	116.8±50	p=<0.001
HDL-C (mg/dl)	44.7±18.2	49.6±5	p=<0.001
Fasting (mg/dl)	142.7±55	123.3±48	p=<0.001

Table 3 Comparing the clinical data among groups (Metabolic and Non Metabolic) of type 2 diabetic subjects in females.

Table3 showing comparison between metabolic and non metabolic group in femalesn=43

Parameter	Subjects with metabolic syndrome n1 = 25	Subjects without metabolic syndrome n2= 18	Significance
Age (year)	54±7	52±75	p=0.096
Waist Circumference (Inches)	38.4±2	34.2±2	p=<0.001
SBP (mmHg)	132.7±18	123.4±16	p=<0.001
DBP (mmHg)	85.2±11.1	72.32±10	p=<0.001
Diabetes duration yrs	5.8±3	4.7±2	p=<0.001
Triglyceride (mg/dl)	151.3±61	119.8±55	p=<0.001
HDL-C (mg/dl)	42.6±20	50.4±20	p=<0.001
Fasting (mg/dl)	157±58.6	149.3±55	p=0.496

Discussion :

In our study we assessed the prevalence of Metabolic syndrome in Indian diabetic population attending opd of medicine department of SGT medical college using National Cholesterol Education Program-Adult Treatment Panel-III (NCEP- ATPIII).The study also compared different parameters defining metabolic syndrome between male and females. In our study we observed the mean Age group of 56±8.5 in males and 54±7 in females which was also in study done by **Biju Jacob et.al**(16). The prevalence of metabolic syndrome in diabetes was found to be 46% which was also seen in study done by **Dhananjay Yadav et al**(17). In our study we also observed that the prevalence of metabolic syndrome was higher in female population with male: female percentage of (44% vs 59.1%) consistent with studies done by **Felix-Val et al***(18)* **Ford et al** *(19) and also by* **Dhananjay Yadav et al**(17) in Indian population. While taking detailed history in patients it was observed that females in this part of the usually where doing household work and had a sedentary life style and there was noncompliance to treatment in females more than the males this lead to females more prone to metabolic syndrome than males. In female we had a significant relation to duration of diabetes and development of metabolic syndrome with p value<0.0001 with was again statistically significant when compared to disease duration of diabetics without metabolic syndrome while as in males there was no such significance found. We went a step further and observed that there is increased prevalence of metabolic syndrome with increasing age in diabetic population these findings were consistent with studies done by **Azizi et al 2003** (20); **Ford & Giles 2003** (21).

While coming to a conclusion that prevalence of metabolic syndrome is increased in patients with type II diabetes we have taken a reference of study done in general population in north India where it was found That **ICMR task force collaborative study reported** (22) the prevalence of metabolic syndrome to be 30 per cent in urban areas of Delhi and 11 per cent in rural Haryana using ATP-3 criteria. **Mishra et al** *(23)* reported 30 per cent prevalence among the urban slum population in Delhi. In a study of heart disease among the NHANES III participants **Alexander et al., 2003**(24)the excess prevalence of coronary heart disease attributable to Metabolic syndrome and/or diabetes was found to be 37.4% in the group with metabolic syndrome without diabetes and 50.3% in the group with both metabolic syndrome and diabetes. In this regard it is of particular concern that two-thirds of patients with T2DM actually met the criteria of the Metabolic syndrome despite being treated for diabetes, hypertension and dyslipidaemia, with most subjects satisfying the waist circumference, blood pressure and glycemic criteria. Hence justifies the importance of our research.

Conclusion

Prevalence of metabolic syndrome is higher in diabetics with more preponderance to female sex the relation being attributed to sedentary lifestyle in females.

As prevalence of coronary artery disease is more in patients of diabetes with metabolic syndrome then non diabetics with metabolic syndrome so we recommend early evaluation and treatment strategies to be endorsed in diabetics targeting other components of metabolic syndrome.

Population based awareness strategies and education about diabetes and metabolic syndrome and its long term and short term complications to be delivered to patients.

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