



Type 2 diabetes Mellitus (T2DM) and Metabolic syndrome (MetS): An observational trial to evaluate the prevalence as per IDF criteria in Bihar

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Abstract

Background and Objective: Prevalence of metabolic syndrome (MetS) which mainly because increasing trends towards obesity, sedentary life style, Hypertension, diabetes mellitus and dyslipidaemia, now rising at very higher rate in India including eastern part of it like Bihar. Early initiation of life style therapies after diagnosis of MetS in day to day medical practice can reduce the risk of atherosclerotic cardiovascular disease in susceptible population like in diabetes mellitus. The main objective of these study was to evaluate the prevalence of metabolic syndrome among T2DM patients who reside in Bihar by applying International Diabetes Federation (IDF) criteria.

Method: This is a hospital based observational cross sectional study done in T2DM patients who had attended the out patients department. After taking the informed consent fasting blood samples of 380 T2DM patients (190 males and 190 females) were collected to assess lipid profile and other serological test (if needed) and blood pressure and anthropometric parameters (weight, height and waist measurements) were also measured and recorded. IDF (2006) criteria were used for assessment of metabolic syndrome. Preformed proforma were used for data collection results analysed by SPSS-16 software.

Result: Metabolic syndrome prevalence in T2DM patients as per IDF criteria were 84%. As compared to 65 males (34.2%) with 83 females (43.7%) having significantly higher prevalence of metabolic syndrome. By using IDF criteria cases with metabolic syndrome were detected in higher number. T2DM subjects specially from Bihar in this study had shown high prevalence of abdominal obesity followed by hypertension. Females in the age group 31-40 years 24 (28.9%) and 41-50 years 24 (28.9%) having more prevalence of metabolic syndrome where as for men it was more in 41-50 years 29 (44.6%) and 51-60 years 29 (44.6%) age groups. In females, the driving forces for metabolic syndrome were central obesity in 155 (81.7%) and hypertension in 123 (64.7%) followed by hypertriglyceridemia in 99 (52.1%) patients whereas for men it was hypertriglyceridemia in 130 (68.4%) and central obesity in 129 (67.9%), followed by hypertension in 113 (59.4%) patients.

Based on BMI, 105 males (55.2%) were obese 52 (27.4%) were overweight and 33 (17.3%) had normal BMI, in other hand for female subjects it was 144 (75.8%) were obese, 30 (15.8%) were overweight and 16 (8.4%) had normal BMI.

Conclusion: In Bihar, high prevalence of MetS in T2DM patients were observed in this study by applying IDF criteria. Central obesity for women and Increased serum triglyceride for men were the strongest risk factors. This study has established that metabolic syndrome is a significant health problem for T2DM subjects and that needs to be tackled with proven strategies.

Keyword: Metabolic syndrome, Type 2 Diabetes, dyslipidemia, Hypertension.

Introduction

By 2025 the prevalence of diabetes mellitus (DM) is projected to be 6.3% which is compared with 2003 will be increased by 24.0%. There will be 333 million (a 72.0% increase) diabetics by 2030 in individuals of 20 to 79 years of age^[1]. Environmental factors like obesity (central or general), physical inactivity, and diet (saturated fats and trans fatty acids) and socioeconomic factors are responsible for development of DM^[2]. T2DM and cardiovascular disease have many risk factors in common, and many of these risk factors are highly correlated with one another^[3,4,5]. The relationships among these risk factors may be attributable to a small number of physiological phenomena, perhaps even a single phenomenon. Subjects with impaired glucose tolerance (IGT) are at increased risk of developing T2DM and form an important high-risk group for actions aimed at preventing the disease^[6-9].

In between 7.9% and 43% in males The worldwide prevalence of MetS among male and the same almost 7% and 56% in females^[10]. Prevalence of metabolic syndrome (MetS) which mainly because increasing trends towards obesity, sedentary life style, Hypertension, diabetes mellitus and dyslipidaemia, now rising at very higher rate in India including eastern part of it like Bihar. Early initiation of life style therapies after diagnosis of MetS in day to day medical practice can reduce the risk of atherosclerotic cardiovascular disease in susceptible population like in diabetes mellitus.

The main objective of these study was evaluating the prevalence of metabolic syndrome in T2DM patients who mainly resided in Bihar by applying International Diabètes Federation (IDF) criteria.

Methods

This is a hospital based observational cross sectional study done in T2DM who had attended the out patient's department.

After taking the informed consent fasting blood samples of 380 T2DM patients (190 males and 190 females) were collected to assed lipid profile

and other serological test (if needed) and blood pressure and anthropometric parameters (weight, height and waist measurements) were also measured and recorded. IDF (2006) criteria were used for assessment of metabolic syndrome. Patients with type 1 diabetes, terminally ill patients and those who failed to give consent were excluded from the study.

Preformed proforma were used for data collection after explaining the procedure and the objectives of the study and complete confidentiality of the collected data was ensured to them.

According to the IDF 2006 criteria, the diagnosis of MetS was made when abdominal obesity (waist circumference ≥ 90 cm for men and ≥ 80 cm for women) plus two or more of the following risk factors: blood pressure $\geq 130/85$ mm Hg, fasting plasma glucose (100 mg/dl) or pre-existing diabetes, serum triglycerides (≥ 150 mg/l) and HDL levels for men (<40 mg/ dl) and women (<50 mg/dl) were detected.

Results analysed by SPSS-16 software and as mean \pm S.D or as percentage all the data were expressed. The statistical significance was assumed at p-value <0.05 . The student t-test was used to analyse the differences between patients with MetS and without MetS and chi square analysis was performed to find out the significant differences in the proportions.

Results

Demographic, anthropometric and biochemical indices in T2DM males with and without metabolic syndrome is illustrated in Table 1. As compared to males without MetS the values of waist circumference (WC), BMI, Lipid profile including TG and SBP and DBP were significantly greater and the differences were statistically significant (Table 1).

Table 1 Demographic, anthropometric and biochemical indices in T2DM males with and without metabolic syndrome.

Variables	With MetS (Mean±SD)	Without MetS (Mean±SD)	P value
Age (Years)	53.7±6.2	53.7±6.2	1.51
Duration of Diabetes (Years)	5.7±2.4	6.6±2.8	0.61
Waist Circumference (cm)	97.9±6.17	90.3±7.84	<0.01
BMI (Kg/m2)	27.1±2.17	27.1±2.17	<0.05
Fasting Blood Sugar (mg/dl)	271.82±97.7	283.74±117.5	0.51
Triglyceride (mg/dl)	283.76±91.3	223.12±84.1	<0.01
HDL (mg/dl)	53.21±12.16	53.41±10.96	0.13
SBP (mm/Hg)	132.76±12.8	128.59±14.6	<0.05
DBP (mm/Hg)	90.72±10.3	84.11±7.1	<0.01

In females with MetS, TG, WC, DBP were significantly higher and HDL was significantly lower as compared to females without MetS (Table 2).

Table 2 Demographic, anthropometric and biochemical indices in type 2 diabetes females with and without metabolic syndrome.

Variables	With MetS (Mean ± SD)	Without MetS (Mean ± SD)	P Value
Age (years)	49.41 ± 12.04	50.86 ± 9.72	0.36
Duration of Diabetes (years)	6.05 ± 3.71	5.85 ± 3.43	0.07
Waist Circumference (cm)	91.97 ± 8.62	84.12 ± 11.72	<0.001
BMI (kg/m2)	28.18 ± 4.15	27.03 ± 4.52	1.24
Fasting Blood Sugar (mg/dl)	212.49 ± 93.84	188.86 ± 123.89	0.96
Triglycerides (mg/dl)	197.69 ± 87.65	131.01 ± 74.49	<0.05
HDL (mg/dl)	45.67 ± 13.49	54.16 ± 14.71	<0.05
SBP (mm/Hg)	132.56 ± 16.22	133.08 ± 17.16	0.04
DBP (mm/Hg)	85.00 ± 11.10	79.57 ± 8.53	2.29

Metabolic syndrome prevalence in diabetes patients as per IDF criteria were 84%. As compared to 65 males (34.2%) with 83 females (43.7%) having significantly higher prevalence of metabolic syndrome. Based on BMI, 105males (55.2%) were obese 52 (27.4%) were overweight and 33 (17.3%) had normal BMI, in other hand for female subjects it was 144 (75.8%) were obese , 30 (15.8%) were overweight and 16 (8.4%) had normal BMI. (Table 3)

Table 3: Age distribution and gender differences in the prevalence of obesity and metabolic syndrome in T2DM patients.

Variables	Males (N=190)	Females (N=190)	P value
Age (Years)			<0.005
31-40	11 (5.8%)	37 (19.4%)	
41-50	71 (37.3%)	67 (35.3%)	
51-60	88 (46.3%)	40 (21%)	
61-70	20 (10.6%)	46 (24.2%)	
BMI (kg/m2)			<0.0001
Normal	33 (17.3%)	16 (8.4%)	
Overweight	52 (27.4%)	30 (15.8%)	
Obese	105 (55.2%)	144 (75.8%)	
Metabolic Syndrome			<0.001
Absent	125 (65.8%)	107 (56.3%)	
Present	65 (34.2%)	83 (43.7%)	

By using IDF criteria cases with metabolic syndrome were detected in higher number. T2DM subjects who resided in Bihar, showed high prevalence of abdominal obesity followed by hypertension. Females in the age group 31-40 years 24 (28.9%) and 41-50 years 24 (28.9%) having more prevalence of metabolic syndrome whereas for men it was more in 41-50 years 29 (44.6%) and 51-60 years 29 (44.6%) age groups. (Table 4)

Table 4: Prevalence of metabolic syndrome across different age groups.

Age Group	Females	Males
31-40	24 (28.9%)	4 (6.2%)
41-50	24 (28.9%)	29 (44.6%)
51-60	16 (19.3%)	29 (44.6%)
61-70	19 (22.9%)	3 (4.6%)

In females, the driving forces for metabolic syndrome were central obesity in 155 (81.7%) and hypertension in 123 (64.7%) followed by hypertriglyceridemia in 99 (52.1%) patients whereas for men it was hypertriglyceridemia in 130 (68.4%) and central obesity in 129 (67.9%), followed by hypertension in 113 (59.4%) patients.

Table 5 Gender differences in the prevalence of MetS risk factors.

	Males	Females
Increased FBS	183 (96.3%)	174 (91.7%)
Central obesity	129 (67.9%)	155 (81.7%)
Increased TG	130 (68.4%)	99 (52.1%)
Decreased HDL	37 (19.47%)	88 (46.5%)
Hypertension	113 (59.4%)	123 (64.7%)

Central obesity and diabetes with any two other risk factors had clustering in T2DM male patients

with metabolic syndrome. Whereas for females it was T2DM and central obesity with any one risk factor. Only few individuals had clustering of all the risk factors (Table 6).

Table 6 Pattern of Clustering of components of metabolic syndrome.

Components of MetS	Males	Females
Any 1	44 (23.2%)	69 (36.3%)
Any 2	62 (32.6%)	59 (31.1%)
Any 3	2 (1%)	23 (12.1%)

Discussion

Metabolic syndrome is a constellation of metabolic abnormalities namely hypertriglyceridemia, decreased HDL cholesterol, impaired fasting glucose which along with hypertension and central obesity confer an increased risk for development of cardiovascular disease and diabetes mellitus. But there are few studies specially in eastern part of India like in Bihar State that have reported the prevalence of metabolic syndrome in diabetes population.

In the present study, metabolic syndrome was found to be more common in females suffering from T2DM as compared to their male counterparts. Similar findings have been reported by many studies in the developing countries^[10-14].

In the present study, among women high prevalence of the MetS was found could be due to the fact that abdominal obesity was found significantly higher rate in woman and one of the components of the MetS according to the IDF criteria used in the study

Dyslipidaemia has been commonly demonstrated in subjects with metabolic syndrome^[15]. The altered lipid levels associated with atherogenic dyslipidaemia are individual and collective risk factors for cardiovascular diseases^[16, 17]. Among the biochemical parameters assayed in this study, the atherogenic lipid parameters such as total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), and triglyceride (TG) levels were found to be significantly higher among the female participants compared to their male counterparts (Table 2).

Metabolic syndrome prevalence in diabetes patients as per IDF criteria were 84%. As compared to 65 males (34.2%) with 83 females (43.7%) having significantly higher prevalence of metabolic syndrome. By using IDF criteria cases with metabolic syndrome were detected were detected in higher number. T2DM subjects who mainly reside in Bihar showed high prevalence of abdominal obesity followed by hypertension.

We are not aware of studies at the national or regional level that have assessed and compared the output of various criteria for defining MetS in people with diabetes in eastern part of India like this. The growing population of individuals with diabetes in the region invites reliable tools to backup strategies for improving their cardiovascular health.

Regardless, these observations are alarming, as they imply great vulnerability for the onset of a syndrome that contributes to the development of complications that are frequently irreversible. In this sense, gathering a multi-professional health team is essential to curb the factors responsible for the onset of this set of cardio-metabolic changes. Based on this, considering the magnitude of MetS in a population of individuals with diabetes provides better technical-scientific support for the work of the clinicians team, whether it is in primary health care, hospital services or even in the academic world, through greater incentive to research on this theme.

Conclusion

High prevalence of MetS in type 2 diabetes patients were observed in this study by applying IDF criteria. Central obesity for women and Increased serum triglyceride for men were the strongest risk factors. This study has established that metabolic syndrome is a significant health problem for T2DM subjects and that needs to be tackled with proven strategies.

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