Original Research Article

Study of prevalence of metabolic syndrome in type 2 diabetes mellitus patients at a tertiary hospital

Buddhiraj Shantinath Patil

Assistant Professor, Department of Medicine, D. Y Patil Medical Collage, Kasaba Bawda, Kolhapur, D Y Patil Medical Collage And Hospital, Kadamwadi, Kolhapur, Maharashtra, INDIA.
Email: dr.buddhirajpatil86@gmail.com

Abstract

Background: Metabolic syndrome which is also known as syndrome X is characterized by low concentration of high density lipoprotein cholesterol (HDL), hypertriglyceridaemia, impaired glucose tolerance, increased blood pressure and central obesity. According to NCEP ATP III, individuals with metabolic syndrome are at risk of developing Cardiovascular Disease (CVD) and insulin resistance, which confers risk for type 2 Diabetes. This study was done to report the prevalence of metabolic syndrome in patients with type 2 diabetes melitus attending diabetes clinic at our tertiary health center. **Material and Methods:** Present study was a cross-sectional, observational study conducted in out-patient department of Medicine in randomly selected 400 (200 male, 200 female) type II diabetic subjects, from 30-70 years age group, who were willing to participate and who had given informed written consent were considered for present study. Metabolic syndrome was diagnosed according to the NCEP:ATP III criteria and prevalence was calculated. **Results:** Total 400 diabetes mellitus patients were included in present study (200 – male, 200- female). Prevalence of metabolic syndrome was noted to be 61% as NCEP-ATPIII criteria (30% male, 31% female). Mean age of males 51 ± 9.7 years and females 50 ± 11.1 years. Family history of diabetes melitus, hypertension was present in 41 % and 55 % patients respectively. In patients with metabolic syndrome, low high density lipoprotein cholesterol was noted in 38 % (18% – male, 20% - female), significant waist circumference (≥94 cm in men, >80 cm in women) in 64 % (31% – male, 33% - female) and duration of diabetes mellitus >5 years in 64 % (32% – male, 31% - female). A significant difference between male and female was noted in low HDL cholesterol, significant waist circumference and duration of diabetes mellitus >5 years variables. Prevalence of metabolic syndrome was noted to be 61% as NCEP-ATPIII criteria. **Conclusion:** In type 2 diabetic patients with obesity and hypertension are at a high risk of developing metabolic syndrome components. Awareness should be spread among newly diagnosed diabetics about risk associated with metabolic syndrome.

Keywords: Metabolic syndrome, Type 2 diabetes, central obesity, HDL cholesterol

***Address for Correspondence:**
Dr Buddhiraj Shantinath Patil, Assistant Professor, Department of Medicine, D. Y Patil medical Collage, Kasaba Bawda, Kolhapur, D Y Patil Medical Collage and Hospital, Kadamwadi, Kolhapur, Maharashtra, INDIA.
Email: dr.buddhirajpatil86@gmail.com

Received Date: 09/10/2019 Revised Date: 13/12/2019 Accepted Date: 24/01/2020
DOI: https://doi.org/10.26611/10211517

Access this article online

Quick Response Code:

Website: www.medpulse.in

Accessed Date: 17 July 2020

INTRODUCTION

Metabolic syndrome which is also known as syndrome X is characterized by low concentration of high density lipoprotein cholesterol (HDL), hypertriglyceridaemia, impaired glucose tolerance, increased blood pressure and central obesity.[1] Metabolic syndrome is a constellation of metabolic risk factors comprising abdominal obesity, glucose intolerance, hyperinsulinaemia, hypertension and dyslipidemia characterized by low levels of HDL-cholesterol and elevated levels of triglycerides India is witnessing a depressing situation due to escalating incidence and prevalence of type 2 diabetes mellitus (T2DM) and its inevitable outcomes of cardiovascular diseases (CVD), diabetic neuropathy, nephropathy and retinopathy.[2] The co-occurrence of diabetes mellitus and MS potentiates the cardiovascular risk associated with each of the two conditions. Asian Indians tend to develop central obesity rather than generalized obesity. Underlying

How to cite this article: Buddhiraj Shantinath Patil. Study of prevalence of metabolic syndrome in type 2 diabetes mellitus patients at a tertiary hospital. *MedPulse International Journal of Medicine.* July 2020; 15(1): 33-37. https://www.medpulse.in/Medicine/

the problem are complex factors—genetic, physiological, psychological, familial, social, economic, and political—coalescing to over determine these conditions.[3] According to National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) individuals with MetS are at risk of developing Cardiovascular Disease (CVD) and insulin resistance, which confers risk for type 2 Diabetes.[4] This study was done to report the prevalence of metabolic syndrome in patients with type 2 diabetes melitus attending diabetes clinic at our tertiary health center.

MATERIAL AND METHODS

Present study was a cross-sectional, observational study conducted in out-patient Department of Medicine, D. Y Patil Medical Collage, Kasaba Bawda. Study was conducted from September 2019 to March 2020. Institutional ethical committee approval was taken for present study. A total of 400 (200 male, 200 female) type II diabetic subjects, from 30-70 years age group, who were willing to participate and who had given informed written consent were considered for present study. The diabetic subjects were attending the diabetic OPD in our hospital, running twice weekly (on Tuesday and Friday). Detailed history and General physical examination was done and waist circumference was measured. 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 sample was collected by venepuncture of antecubital vein after an overnight fast. Venous blood was collected in oxalate and fluoride vials for measurement of glucose, and plain vials for estimating High Density Lipoprotein (HDL) and triglycerides TG). Blood sugar fasting/ post prandial was done by glucose oxidase method. Metabolic syndrome was diagnosed according to the NCEP:ATP III criteria (National Cholesterol Education Program and Adult Treatment Panel III). Three or more of the following criteria formed the basis for defining the metabolic syndrome:

1. Central obesity: waist circumference ≥ 90 cm in men and ≥80 cm in women.
2. Hypertriglyceridemia: trglyceride level ≥ 150 mg/dl or specific medication.
3. Low HDL cholesterol: < 40 mg/dl and < 50 mg/dl for men and women, respectively, or specific medication.
4. Hypertension: blood pressure ≥ 130mmhg systolic or ≥ 85mmhg diastolic or specific medication.

Blood pressure was measured with special precaution to reduce the variation of BP value with resting values; individuals were requested to take 10 min rest at sitting position before measuring the BP. BP was taken in sitting posture in the right arm with mercury sphygmomanometer after 10 min of rest and avoiding smoking for last 30 minutes. Blood pressure was measured by standardized protocols, and hypertension was defined based on the criteria of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. 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. We used standard electronic B.P. measuring device.

5. Fasting plasma glucose level ≥ 110mg/dl.

Data are presented as arithmetic mean +/- standard deviation. Student's t-test was used for comparison of numerical variables. Multivariate logistic regression was used to define predictors of metabolic syndrome. Chi-square test was used to determine the level of significance for categorical variables. P values < 0.05 were considered statistically significant. Analysis was done using SPSS statistical software.

RESULTS

Total 400 diabetes mellitus patients were included in present study (200 male, 200 female). Prevalence of metabolic syndrome was noted to be 61% as NCEP-ATPIII criteria (30% male, 31% female). Mean age of males 51 ± 9.7 years and females 50 ± 11.1 years. Family history of diabetes melitus, hypertension was present in 41 % and 55 % patients respectively. In patients with metabolic syndrome, low high density lipoprotein cholesterol was noted in 38 % (18% – male, 20% - female), significant waist circumference (≥94 cm in men, >80 cm in women) in 64 % (31% – male, 33% - female) and duration of diabetes mellitus >5 years in 64 % (32% – male, 31% - female). A significant difference between male and female was noted in low HDL cholesterol, significant waist circumference and duration of diabetes mellitus >5 years variables. Total cholesterol, LDL cholesterol, triglyceride, body mass index, systolic blood pressure, diastolic blood pressure, fasting blood sugar variable difference between male and female cases was not significant.

Table 1: Parameters of study group with type II diabetes (n=400)

Variables	Male (%)	Female (%)	Total (%)	P-value
Total Cholesterol (mg/dl)				
<200	61 (20%)	89 (22%)	170 (43%)	Non-significant
≥200	119 (30%)	111 (28%)	230 (58%)	
Low density Lipoprotein Cholesterol (mg/dl)				
<130	73 (17%)	77 (19%)	146 (37%)	Non-significant
≥130	127 (33%)	123 (31%)	254 (64%)	
High density Lipoprotein Cholesterol (mg/dl)				
<40 (men) <50 (women)	129 (32%)	121 (30%)	250 (63%)	Significant
≥40 (men) ≥50 (women)	71 (18%)	79 (20%)	150 (38%)	
Triglyceride (mg/dl)				
<150	87 (22%)	81 (20%)	168 (42%)	Non-significant
≥150	113 (28%)	119 (30%)	232 (58%)	
Body Mass Index				
Under-weight	5 (1%)	6 (2%)	11 (3%)	Non-significant
Normal weight	83 (21%)	71 (18%)	154 (39%)	
Over	69 (17%)	64 (16%)	133 (33%)	
Obesity	43 (11%)	59 (15%)	102 (26%)	
Systolic Blood Pressure (mmHg)				
<130	91 (23%)	85 (21%)	176 (44%)	Non-significant
≥130	109 (27%)	115 (29%)	224 (56%)	
Diastolic Blood Pressure (mmHg)				
<85	94 (24%)	88 (22%)	182 (46%)	Non-significant
≥85	106 (27%)	112 (28%)	218 (55%)	
Waist circumference (cm)				
<94(men), ≤80(women)	82 (20%)	68 (17%)	146 (37%)	Significant
≥94(men), >80(women)	122 (31%)	132 (33%)	254 (64%)	
Duration of diabetes mellitus (in year)				
<5	71 (18%)	75 (19%)	146 (37%)	Significant
≥5	129 (32%)	125 (31%)	254 (64%)	
Glycemic control / Fasting Blood Sugar (mg/dl)				
Good (≤130)	80 (20%)	76 (19%)	156 (39%)	Non-significant
Poor(>130)	120 (30%)	124 (31%)	244 (61%)	

(P value < 0.05 was considered statistically significant)

Prevalence of metabolic syndrome was noted to be 61% as NCEP-ATPIII criteria. Diagnostic criteria for metabolic syndrome (NCEP-ATPIII criteria) were compared between male and female patients. Central obesity and HDL cholesterol difference between male and female was significant. Central obesity in metabolic syndrome cases was common in female while low HDL cholesterol was common in male patients with metabolic syndrome. Statistical difference between male and female was significant other variables such as increased triglyceride, elevated blood pressure, fasting plasma glucose level was non-significant.

Table 2: Diagnostic definitions of Metabolic Syndrome- NCEP-ATPIII criteria

Variables	Male (%)	Female (%)	Total (%)	P-value
Central obesity	43 (11%)	59 (15%)	102 (26%)	Significant
Increased Triglyceride	113 (28%)	119 (30%)	232 (58%)	Non-significant
Low HDL cholesterol	129 (32%)	109 (27%)	238 (59%)	Significant
Elevated blood pressure	109 (27%)	113 (28%)	222 (55%)	Non-significant
Fasting plasma glucose level	120 (30%)	124 (31%)	244 (61%)	Non-significant
Overall Prevalence of MetS	119 (29%)	124 (31%)	243 (61%)	Non-significant

(P value < 0.05 was considered statistically significant)

For diagnosis of metabolic syndrome any three of five criteria should be present. In 27%, 26% and 9% cases 3,4 and 5 criteria were present. In 13% patients none of the above criteria was present.

Table 3: Metabolic Syndrome (NCEP-ATPIII criteria) components in DM type 2 patients

No of component	Male (%)	Female (%)	Total (%)
0	20 (5%)	33 (8%)	53 (13%)
At least 1	23 (6%)	19 (5%)	42 (11%)
At least 2	38 (10%)	24 (6%)	62 (16%)
At least 3	58 (15%)	48 (12%)	106 (27%)
At least 4	46 (12%)	57 (14%)	103 (26%)
All 5	15 (4%)	19 (5%)	34 (9%)

(P value < 0.05 was considered statistically significant)

DISCUSSION

With rapid urbanization and upgrading to sedentary life style, the prevalence of metabolic syndrome can be expected to rise in Indian population in and around major cities. The metabolic syndrome
has been associated with atherosclerotic cardiovascular disease and several obesity-related disorders including nonalcoholic fatty liver disease with steatosis, fibrosis, cirrhosis, microalbuminuria, chronic kidney disease, sleep disordered breathing, including obstructive sleep apnoea.[5] Risk of developing cerebrovascular disease (CVD) is two times more and type 2 diabetes mellitus is four times more in people with metabolic syndrome as compared to subjects without metabolic syndrome.[6] While stressing the importance of diagnosis of metabolic syndrome, the American Heart Association and the National Heart, Lung and Blood Institute joint statement states " recognition of the syndrome in clinical practice is encouraged for the identification of a multiple risk factor condition and to promote life style therapies that will reduce all of the metabolic risk factors simultaneously."[7] The higher prevalence of metabolic syndrome at younger ages in Asian Indians is of particular concern, as it means that they will have a more prolonged exposure to the atherosclerotic risk factors associated with metabolic syndrome.[8] Several components of the metabolic syndrome, including hyperlipidemia, hypertension, and diabetes have been associated with an increased risk of cognitive decline and dementia.[9] Prevalence of metabolic syndrome in present study was noted to be 61% as NCEP-ATPIII criteria (30% male, 31% female). In a study conducted in urban areas near Mumbai, the prevalence of metabolic syndrome among diabetic patients as per NCEP/ATPIII was 77.2%, 69.33% in males and 87.71% in females and difference was reported to be statistically significant.[10] In study by JL Patel, 85% of the diabetic patients, aged >40 years (female: 80% and male: 90%) met the criteria for diagnosis of metabolic syndrome as per ATP III guidelines.[11] Sachdev Meenakshi, *et al.*. in studied patients attending OPD of cardiology or diabetology noted the prevalence of 72.6% of metabolic syndrome as per modified NCEP-ATP III criteria. When the raised waist circumference was used as an essential criterion as per IDF criteria, the prevalence was found to be lower (64.5%).[12] Studies from Uttar Pradesh and Chennai which estimated the metabolic syndrome among CAD patients had shown the prevalence as 77% and 67.7% respectively.[13,14] In present study, a low level of high-density lipoprotein was identified to be the major contributing factor for metabolic syndrome. A similar pattern was also observed in other studies.[12,15] We also noted that male patients had profound low high-density lipoprotein compared to female patients, similar to study by Sachdev Meenakshi, *et al.*.[12] However other studies noted opposite findings.[16] Obesity has increased in developing countries. Abdominal obesity in particular, is responsible for several metabolic and cardiovascular problems. High risk of developing both diabetes and cardiovascular disease associated with obesity may be due to a predisposition to abdominal obesity leading to metabolic syndrome. Metabolic Syndrome is a premorbid condition that develops in the setting of insulin resistance and factors such as poor diet, physical inactivity, obesity, and genetics play a contributing role. Clinical guidelines for managing MS focus on lifestyle modifications with an emphasis on diet and exercise interventions.[7] Hypertension seems to be the most significant risk factor for both metabolic syndrome and CVD in this population which may require targeted therapeutic and lifestyle interventions to reduce the disease burden in this region. In addition healthcare professionals must support patients with metabolic syndrome in prevention or delaying progression to diabetes, cardiovascular disease, and other related complications.

CONCLUSION

In type 2 diabetic patients with obesity and hypertension are at a high risk of developing metabolic syndrome components. Awareness should be spread among newly diagnosed diabetics about risk associated with metabolic syndrome. Clinician should ensure that screening tests for complications are done especially in hypertensive and obese patients.

REFERENCES

1. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (Adult

Treatment Panel III) final report. Circulation 2002;106:3143-421.
2. Anjana RM, Pradeepa R, *et al.*. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: phase I results of the Indian Council of Medical Research-INdia DIABetes (ICMR-INDIAB) study. Diabetologia 54:3022-3027.
3. Tiwari P, Sankhala A. Prevalence of obesity, weight perception and dietary behaviour of urban college going girls. J Hum Ecol 2007; 21(3): 181–183.
4. Lira Neto JC, Xavier MA, Borges JW, Araujo MF, Damasceno MM, Freitas RW. Prevalence of Metabolic Syndrome in individuals with Type 2 Diabetes Mellitus. Revista brasileira de enfermagem. 2017; 70: 265-270.
5. Sundstrom J, Riserus U, Byberg L, *et al.*. Clinical value of the metabolic syndrome for long term prediction of total and cardiovascular mortality: prospective, population based cohort study. Br Med J 2006;332:878- 82.
6. BlatonVH, KoritaI, BuloA. How is metabolic syndrome related to dyslipidemia? Biochem Med 2008;18:14-24.
7. Grundy SM. Metabolic Syndrome scientific statement by the American Heart Association and the National Heart, Lung and Blood Institute. Arterioscler Thromb Vasc Biol 2005;25:2243-4.
8. Dekker JM, Girman C, Rhodes T. Metabolic syndrome and 10-year cardiovascular disease risk in the hoorn study.Circulation 2005; 112: 666–673.
9. Yaffe K, Kanaya A, Lindquist K, *et al.*. The metabolic syndrome, inflammation, and risk of cognitive decline. J Amer Med Assoc 2004;292:2237-42.
10. Surana SP, Shah DB, Gala K, *et al.*. Prevalence of Metabolic Syndrome in an Urban Indian Diabetic Population Using the NCEP ATP III Guidelines. J Assoc Physicians India 2008;56:865-8.
11. JL Patel, AM Suthar, *et al.*. A study of metabolic syndrome and its components in type 2 diabetes mellitus subjects and their asymptomatic first-degree relatives, Indian Journal of Clinical Practice, Vol. 23, No. 9 February 2013
12. Sachdev Meenakshi, *et al.*. High Prevalence of Metabolic Syndrome among Outpatients in a Tertiary Care Centre, Tamil Nadu, India, Journal of Krishna Institute of Medical Sciences University, Vol. 8, No. 1, January-March 2019.
13. Pradeepa R, Surendar J, Indulekha K, Chella S, Anjana RM, Mohan V. Prevalence of MetS and its Association with Coronary Artery Disease Among an Urban Elderly South Indian Population (CURES- 145). J Assoc Physicians India 2016; 64(5):20-5.
14. Khanna R, Kapoor A, Kumar S, Tewari S, Garg N, Goel PK. Metabolic syndrome and Framingham Risk Score: observations from a coronary angiographic study in Indian patients. Indian J Med Res 2013; 137(2): 295-301.
15. Selvaraj I, Gopalakrishnan S, Logaraj M. Prevalence of metabolic syndrome among rural women in a primary health center area in Tamil Nadu. Indian J Public Health 2012; 56(4):314-7
16. Gupta R, Deedwania PC, Gupta A, Rastogi S, Panwar RB, Kothari K. Prevalence of metabolic syndrome in an Indian urban population. Int J Cardiol 2004;97(2):257-61

Source of Support: None Declared
Conflict of Interest: None Declared