ORIGINAL ARTICLE

FREQUENCY OF METABOLIC SYNDROME IN PATIENTS WITH DIABETES MELLITUS TYPE II

Maryam Paracha[1], Muhammad Haroon Iqbal[1], Kashmala Sarfraz[2]

[1]Department of Pathology, Rai Medical College, Sargodah - Pakistan

[2]Department of Pharmacology, Rai Medical College, Sargodah - Pakistan

ABSTRACT

Objective: To identify frequency of Metabolic Syndrome in diabetics and factors increasing risk of syndrome to avoid its prevalence.

Material &Methods: It is a prospective, descriptive, and cohort study conducted on 113 Diabetics of both sexes aged between 20 to 80 years to find out the frequency of Metabolic Syndrome under the criteria of Adult Treatment Panel III definition. Their anthropometric measurements, blood pressure, fasting blood glucose level and lipid profile were done and student's t-test was applied. Logistic regression analysis showed association of measured variables with the frequency of Metabolic Syndrome.

Results: Metabolic syndrome was found in 80 (males: 29, females: 51) patients (70.8%) out of 113. Individuals having hypertension, obesity and dyslipidemia along with Diabetes Mellitus were found to have Metabolic Syndrome more frequently than those having less of these complications.

Conclusion: The individuals with diabetes are more prone to the Metabolic Syndrome and the complications of Diabetes Mellitus. Moreover, Metabolic Syndrome diagnosis is simple and an easy clinical tool assessing potential risk of metabolic disorders and is found to be more common in individuals of old age group and its prevalence varies with the socioeconomic lifestyle.

Key Words: Metabolic Syndrome, T_2DM (Type 2 Diabetes Mellitus), Anthropometric Measurements, Fasting Blood Glucose levels, Lipid Profile.

This article may be cited as: Paracha M, Iqbal MH, Sarfraz K. Frequency of metabolic syndrome in patients with diabetes mellitus type ii. J Med Sci 2017; 25: (3) 297-301.

INTRODUCTION

The metabolic syndrome (MS) was first described in 1998 by Reaven as "syndrome X".From the classical description by Reaven[1], a common nexus was established: insulin resistance/hyperinsulinemia. Surprisingly, this author did not include obesity in the definition. Later, other authors included the concept of alterations in fat, disorders of glucose, dyslipidemias and hypertension. Since epidemiological studies suggest that > 25% of the general population will gradually develop insulin resistance its diagnosed and treated increasingly within the ambit of PC[3-5] and, as such, has become included in the list of priorities of various public health-care authorities.

Dr. Maryam Paracha (Corresponding Author)
Department of Pathology, Rai Medical College Sargodha - Pakistan
Cell: +92-333-6800943
Email: maryamparacha90@yahoo.com
Date Received: January 27, 2017
Date Revised: July 10, 2017
Date Accepted: September 20, 2017

The metabolic syndrome has a multifactorial causation. The predominant underlying risk factors are obesity (especially abdominal obesity) and insulin resistance. These often occur together, and their relative contributions to the syndrome have not been fully defined. Nonetheless, there is a general agreement that the increasing prevalence of obesity in the Pakistan and worldwide is mainly responsible for the increasing occurrence of the syndrome. Other factors that can exacerbate the metabolic syndrome are physical inactivity, advancing age, endocrine dysfunction, and genetic susceptibility.

In 2001, the National Cholesterol Education Program Adult Treatment Panel III (ATP III) proposed that the metabolic syndrome be introduced into clinical practice as a risk companion to elevated LDL cholesterol (LDL-C)[7,8]. The concept of the syndrome presented in

ATP III was based on more than 2 decades of research on the clustering of metabolic risk factors and it comes off to be the most frequently used criteria for MS. The syndrome was viewed as a clinical condition that is largely elicited by obesity and as one that deserves clinical intervention in practice. The rising prevalence of obesity in the United States was a major stimulus for including the metabolic syndrome as a component of the cholesterol guidelines. For routine practice, simple clinical criteria were proposed for a clinical diagnosis of the syndrome. Diagnosis was based on the identification of at least 3 of 5 risk factors: increased waist circumference (abdominal obesity), increased serum triglyceride, reduced HDL cholesterol (HDL-C), elevated blood pressure, and elevated baseline glucose.

MATERIAL AND METHODS

This was a Prospective, descriptive, multi-centered cohort study where a survey was carried out at an outpatient medical department of three hospitals of Faisalabad and Sargodha. A total of 113 diabetic patients of both genders were taken for random sampling aged between 20 to 80. 40 patients were analyzed from OPD of National Hospital FSD and 22 from Ahmad Polyclinic SGD and 51 from Rasheed Hospital SGD. All diagnosed patients of T2DM were selected for the study between the ages of 20 and 80. Diabetes mellitus was determined according to the answers of responders to the American Diabetes Association guidelines[20] which were used to establish the diagnosis of diabetes (Fasting glucose levels ≥110 mg/dl). whereas T1DM, patients with age less than 20 years and above 80 years, hospitalized patients with macro-vascular complications of diabetes i.e. stroke, acute myocardial infarction and renal failure, physically handicapped patients i.e. patients who are wheelchair bound and have joint problems/arthritis were excluded Material & Methods.

Arterial blood pressure was measured three times with an accuracy of 2 mm using a mercury sphygmomanometer, and with patients in sitting position and each value after an interval of two minutes and the average values were used for the analysis. Waist circumference was measured by a measuring tape by placing it midway between anterior superior iliac spine and the costal margins. Laboratory analyses and Biochemical analyses were done for responders (fasting for at least for 12 hours) on an empty stomach. Concentration of glucose in capillary blood was determined and lipid profile was assessed in venous blood enzymatically

The criteria defining Metabolic Syndrome according to the National Cholesterol Education Program-Adult Treatment Panel III require a combination of at least 3 of the 5 following criteria:

- Abdominal circumference ≥102 cm in males or ≥88 cm in females.
- HDL cholesterol < 1.03 mmol/mL (< 40 mg/dL) [males] or < 1.3 mmol/mL (< 50 mg/dL) [females].
- Triglycerides ≥ to 1.7 mmol/mL (≥150 mg/dL).
- Blood pressure ≥ 130/85 mmHg or the patient receiving hypotensive treatment.
- Baseline glycemia> 6.1 mmol/mL (> 110 mg/dL).

The patients who fulfilled the NCEP criteria for Metabolic Syndrome were entered as those having Metabolic Syndrome.

RESULTS

One hundred and thirteen patients were included in the study. The min age taken was 30 and max observed was 77years. The mean age came to be 51.73 ± 0.892. 52 of the individuals were males (46.017%) and 61 were females (53.98%). MS was seen in 80 subjects (70.8%) while 33 diabetics did not suffer from MS (29.2%). Out of the 80 ones having MS 28 subjects (24.8%) fulfilled 3 out of 5 criteria taken as per ATP definition, 35 were seen to fulfill 4 out of 5 (31.0%) and 17 fulfilled all of the 5 criteria (15.0%).

The mean waist circumference (inches) was 40.059 ± 0.326 showing abdominal obesity. The mean systolic and diastolic blood pressure (mmHg) was 131.42 ± 1.373 and 86.68 ± 0.912 respectively. The mean HDL (mg/dl) was 43.28 ± 0.719.

Number of patients having M.S(Metabolic Syndrome) and fulfilling the ATP(Adult Treatment Panel) criteria. Proposed mechanisms for development of metabolic syndrome.[14]

DISCUSSION

Metabolic Syndrome is a cluster of disorders. Insulin resistance is the main pathophysiologic feature of the metabolic syndrome. Several mechanisms connect

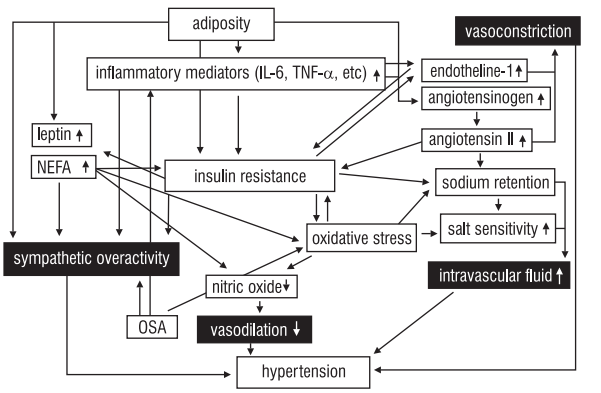

Table 1

	Mean	Standard Deviation	Variance	p-value
Age	51.73 ± 0.892	9.483	89.929	>0.05
Waist Circumference (inches)	40.06 ± 0.326	3.462	11.984	>0.05
Systolic B.P (mmHg)	131.42 ± 1.373	14.600	213.156	>0.05
Diastolic B.P (mmHg)	86.68 ± 0.912	9.697	94.023	>0.05
HDL (mg/dl)	43.28 ± 0.719	7.640	58.366	>0.05

Table 2: Biostatistics of different variables

Total number of patients	113
Diabetics with M.S	80
Diabetics without M.S	33
3 ATP criteria's fulfilled	28
4 ATP criteria's fulfilled	35
5 ATP criteria's fulfilled	17

Table 3: Number of complication seen in 113 patients

Diabetic Neuropathy	2
Diabetic Foot	8
Diabetic Carbuncle	1
Diabetic Ketoacidosis	3
Hypertension	22

insulin resistance with hypertension in the metabolic syndrome. Insulin resistance is associated with obesity, glucose intolerance anddyslipidemia.The dyslipidemia of insulin resistance includes high triglycerides and ApoB, low HDL and apoA1 and increased hepatic lipase activity

Previous studies state an anti-natriuretic effect of insulin[10-12]. This antinatriuretic effect is preserved, and may be increased in individuals with insulin resistance, and this effect may play an important role for development of hypertension in the metabolic syndrome[13]. So, Hypertension and dyslipidemia were found to be the most common problems amongst the diabetic Metabolic Syndrome individuals. 22 patients out of 113 were hypertensive and 17 had poor lipid profiles.

The Metabolic Syndrome individuals who suffer from Diabetes Mellitus type 2 get more complications as compared to diabetics having no Metabolic Syndrome (63.9% vs. 46.6%). Similarly patients with Metabolic Syndrome get more complications as compared to those having no Metabolic Syndrome (17.2 % vs. 8.9%)[21,22,23]. We found that patients with more complications of diabetes were more prone to fulfilling the criteria of Metabolic Syndrome. Two individuals showed off diabetic neuropathy, eight were found to be having diabetic foot, one female had diabetic carbuncle and three came with complaint of Diabetic ketoacidosis.

Accumulated visceral adipose tissue produce and secrete a number of adipocytokines, such as leptin, tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), angiotensinogen, and non-esterified fatty acids (NEFA), which induce development of hypertension[24]. Visceral Obesity has been suggested to play a fundamental role in the simultaneous development of Hyperglycemia, Hyperlipidemia, and hypertension. Visceral obesity is the main cause of the metabolic syndrome, and is associated with development of hypertension in the metabolic syndrome via a variety of pathways.

Previous reports in the literature state that prevalence of the metabolic syndrome increased with age[25,26]. The age group of 46-60 years showed a frequency of 50 patients with fourteen patients fulfilling three criteria, twenty seven patients fulfilling four criteria and nine patients showed all five criteria's of Metabolic Syndrome. It was evident that the frequency of Metabolic Syndrome increases with age. As expected, the prevalence of the metabolic syndrome varied by age group. We found that the prevalence of the metabolic syndrome increased with age irrespective of the definitions used. The highest prevalence of the metabolic syndrome (irrespective of definition) was recorded in men and women aged 46-60 years.

The authors of some studies[27-30] suggested that life-course socioeconomic position appeared to be an important confounder in the association of the metabolic syndrome with diabetes. In our study, the impact of the socioeconomic status on the Metabolic Syndrome and diabetes was not analyzed directly, yet, our data specified some of the features. People from better socioeconomic position were more prone to visceral obesity while people from unstable background have a greater risk of being malnourished and less likely to develop visceral obesity. Therefore, increasing recognition of risk levels in the population with a simple focus on waist size and hypertension, along with corrected lifestyle habits (smoking, physical activity, healthy nutrition habits), are important steps in addressing the metabolic problems.

CONCLUSION

Among type 2 diabetics more female patients suffer from metabolic syndrome,and have potentially increased risks of developing complications of diabetes including all the cardiovascular events as well and vice versa.

RECOMMENDATIONS

Recognition of metabolic syndrome and it's prompt management can help preventing complications in diabetic patients. The diagnosis of Metabolic syndrome can be considered as a tool in risk assessment of complications development in diabetic patients. Prevention of complications in type 2 diabetic patients can increase both the quality and quantity of life of such patients. So,this problem needs proper adressal and policies should be made to halt the development of Metabolic syndrome by proper health education of the patients regarding this serious health issue and providing them enough facilities and help to adapt to a healthy lifestyle. As complications of diabetes mellitus type 2 and metabolic syndrome can ultimately be lethal.

ACKNOWLEDGEMENTS

The authors thank the medical and paramedical staff of National hospital Faisalabad, Ahmad Polyclinic and Rasheed Hospital Sargodha for their constant support, help and guidance for our research efforts. We are indebted to the Naveed Medical Laboratories Faisalabad, Pak Care Lab Sargodha and Malik Lab Sargodha for their expertise in the blood chemistry analysis and the doctors of above mentioned hospitals for their help in the collection of the clinical histories.

REFERENCES

1. Reaven GM: Role of insulin resistance in human disease. Diabetes 1988, 37:1595-1607.
2. Rupp H: Insulin resistance, hyperinsulinaemia, and cardiovascular disease. The need for novel dietary prevention strategies. Basic Res Cardiol 1992, 87: 99-105.
3. McAuley KA, Williams SM, Mann JI, Walker RJ, Lewis-Barned NJ, Temple LA, et al.: Diagnosing insulin resistance in the general population. Diabetes Care 2001, 24:460-64.
4. Gerstein HC, Anand S, Yi QL, Vuksan V, Lonn E, Teo K, et al.: The relationship between dysglycemia and atherosclerosis in South Asian, Chinese, and European individuals in Canada: a randomly sampled cross-sectional study. Diabetes Care 2003, 26: 144-49.
5. Costa B, Cabré JJ, Martín F: Metabolic syndrome, insulin resistance and diabetes. What is hidden beneath the tip of the iceberg? Aten Primaria 2003, 31:436-45.
6. Metabolic Syndrome Scientific Statement by the American Heart Association and the National Heart, Lung, and Blood Institute http://atvb.ahajournals.org/content/25/11/2243.full
7. Expert Panel on Detection Evaluation, and Treatment of High Blood Cholesterol in Adults: Executive summary of the 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). J Am Med Assoc. 2001; 285: 2486-97.
8. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). 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: 3143–3421.
9. http://professional.diabetes.org/Content/Posters/2008/p1012-P.pdf
10. Miller JH, Bogdonoff MD: Antidiuresis associated with administration of insulin. J ApplPhysiol 1954, 6:509-12.
11. Nizet A, Lefebvre P, Crabbe J: Control by insulin of sodium potassium and water excretion by the isolated dog kidney. Pflugers Arch 1971, 323:11-20.
12. DeFronzo RA, Cooke CR, Andres R, Faloona GR, Davis PJ: The effect of insulin on renal handling of sodium, potassium, calcium, and phosphate in man. J Clin Invest 1975, 55:845-55.
13. Sechi LA: Mechanisms of insulin resistance in rat models of hypertension and their relationships with salt sensitivity. J Hypertens 1999, 17:1229-37.
14. Nutrition Journal 2008, http://www.nutritionj.com/content/7/1/10
15. International Diabetes Federation Diabetes Atlas. Unwin N, Whiting D, Gan D, Jacqmain O, Ghyoot G, editors. IDF Diabetes Atlas. 4 th ed. Belgium: International Diabetes Federation; 2009. p. 11-13.
16. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes, estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27:1047-53.
17. Anand SS, Yusuf S, Vuksan V, Devanesen S, Teo KK, Montague PA, et al. Differences in risk factors, atherosclerosis, and cardiovascular disease between ethnic groups in Canada: The study of health assessment and risk in ethnic groups [SHARE]. Lancet 2000;356:279-84.
18. Ford ES, Giles WH, Dietz WH .Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey.. SourceCenters for Disease Control and Prevention, JAMA. 2002 . 16;287(3):356-59.
19. Metabolic syndrome: frequency and gender differences at an Out-Patient clinic. The Aga Khan University Hospital, Karachi J Coll Physicians Surg Pak Jan 2007;17(1):32-520.

21. Research article Open Access Metabolic Syndrome as a Cardiovascular Disease Risk Factor: Patients Evaluated in Primary Care American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2004;27 Suppl 1: 5-10.

22. Isomaa B, Almgren P, Tuomi T, Forsén B, Lahti K, Nissén M, et al.: Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care 2001, 24:683-89.

23. Gerstein HC, Anand S, Yi QL, Vuksan V, Lonn E, Teo K, et al.: The relationship between dysglycemia and atherosclerosis in South Asian, Chinese, and European individuals in Canada: a randomly sampled cross-sectional study. Diabetes Care 2003, 26: 144-49.

24. Katagiri H, Yamada T, Oka Y: Adiposity and cardiovascular disorders: disturbance of the regulatory system consisting of humoral and neuronal signals. Circ Res 2007, 101:27-39.

25. Adams RJ, Appleton S, Wilson DH, Taylor AW, Grande ED, Chittleborough C, et al. Population comparison of two clinical approaches to the metabolic syndrome. Implications of the new International Diabetes Federation consensus definition. Diabetes Care 2005;28:2777-79.

26. Park YW, Zhu S, Palaniappan L, Heshka S, Carnethon MR, Heymsfield SD. The metabolic syndrome: prevalence and associated risk factor findings in the U.S. population from the Third National Health and Nutrition Examination Survey, 1988–1994. Arch Intern Med 2003;163:427-36.

27. Lawlor DA, Smith GD, Ebrahim S. Does the new International Diabetes Federation definition of the metabolic syndrome predict CHD any more strongly than older definitions? Findings from the British Women's Heart and Health Study. Diabetologia2005;49:1-8.

28. Nilsson PM, Engström G, Hedblad B. The metabolic syndrome and incidence of cardiovascular disease in non-diabetic subjects – a population-based study comparing three different definitions. Diabet Med 2007;24(5):464-72.

29. Buckland G, Salas-Salvadó J, Roure E, Bulló M, Serra-Majem L. Sociodemographic risk factors associated with metabolic syndrome in a Mediterranean population. Public Health Nutr 2008;11(12):1372-78.

30. Santos AC, Ebrahim S, Barros H. Gender, socio-economic status and metabolic syndrome in middle-aged and old adults. BMC Public Health 2008;8:62-64.

CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Paracha M: Main idea.

Iqbal MH: Data Collection & Typing

Sarfraz K: Bibliography & Statistics

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.