PREVALENCE OF METABOLIC SYNDROME IN PRE AND POST MENOPAUSAL DIABETICS

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ABSTRACT

This study was designed to determine the frequency of metabolic syndrome in diabetic females and to compare the pre-menopausal and post-menopausal diabetics for the presence of metabolic syndrome. This is a comparative cross-sectional study carried out at the Out patient diabetic clinic Mayo Hospital, Lahore, from Jan., 2007 to May 2007. All adult diabetic females coming for regular checkup to out patient department of diabetic clinic during our study duration were included and informed their consent was taken. The data was collected using a structured questionnaire. Metabolic syndrome was defined according to National Cholesterol Education Program Adult Treatment Panel III. There were 200 participants in the study, hundred were pre-menopausal and the remaining post-menopausal. Among them 30% cases were hypertensive, 28% cases were obese 10% had dyslipidaemia. Eight percent had increased triglyceride level and 2% had decreased high density lipoproteins level. Metabolic syndrome was found in 28% of diabetic females, 21% of post-menopausal and 7% of pre-menopausal diabetics. Thus the comparison for the presence of metabolic syndrome showed a significant value ($p<0.05$). All diabetics especially post-menopausal females should be assessed for the presence of metabolic syndrome for better quality of life and prevention of complications.

INTRODUCTION

According to World Health Organization, at least 171 million people worldwide suffer from diabetes. Its incidence is increasing rapidly, and it is estimated that by the year 2030, this number will double.[1] Its association with metabolic syndrome results in a bleak picture by increasing the risk of ischaemic heart disease and stroke. Clinical features are fasting hyperglycaemia, high blood pressure, central obesity (also known as visceral, male-pattern or apple shaped adiposity), overweight with fat deposits mainly around the waist, decreased HDL, elevated triglycerides, elevated uric acid levels.[1] Fortunately metabolic syndrome is preventable by life style modification, creating awareness, early diagnosis and treatment.

The National Cholesterol Education Program Adult Treatment Panel III (2001) requires at least three of the following to diagnose metabolic syndrome.[2]

1. Obesity/waist circumference> 102 cm or 40 inches (males), >88 cm or 36 inches (females).
2. Dyslipidaemia: Triglycerides> 150 (mg/dl).
3. Dyslipidaemia: High density lipoproteins < 40 mg/dl (male), 50 mg/dl (female).
4. Blood pressure> 130/85 mm Hg.
5. Fasting plasma glucose>l 10 mg/dl.

The pathophysiology of metabolic syndrome is complex and has only been partially elucidated. Most patients are older, obese, sedentary, and have a degree of insulin resistance. The most important risk factors in order are[3]:

1. Lifestyle i.e decreased physical activity and excess caloric intake.
2. Age.
3. Gender.
4. Genetics.

Thus we planned a study to find the magnitude of problem of metabolic syndrome in our diabetic females coming for regular check-ups in out patient Diabetic Clinic of a teaching hospital and to compare the pre and post menopausal diabetics for the factors of metabolic syndrome. By doing so proper measures should be taken to prevent the deadly complications of metabolic syndrome in time and awareness can be created to achieve life style modifications in diabetics before they end up in metabolic syndrome and its associated mortality.

PATIENTS AND METHODS

It was a cross-sectional study, conducted at the out patient diabetic clinic of Mayo Hospital Lahore from Jan., 2007 to May 2007.

All adult females having fasting blood sugar > 110 mg/dl, appearing for the regular check-ups at diabetic out patient clinic Mayo Hospital, were included in the study. All those who were eligible but

did not give the informed consent were excluded.

Data was collected for waist circumference (at narrowest point between umbilicus and rib cage), systolic and diastolic blood pressure, fasting level of triglycerides, high density lipoproteins and information about menstruation.

Metabolic syndrome was characterized to be there when in addition to diabetes any two of the following were present[2]:

1. Blood pressure > 130/85.
2. Obesity or waist circumference>88 cm.
3. Triglycerides>150 mg/dl.
4. High density lipoproteins<50 mg/dl.

Menopause was defined as complete cessation of menstruation for > 1 year without any surgical or medical intervention. Before menopause was defined as pre-menopause and when more than 1 year had passed after menopause was called post-menopause. Frequencies and percentages were calculated to report the objective of the study. We compared between pre and post menopausal diabetics for the differences in components of metabolic syndrome e.g., waist circumference, blood pressure, triglycerides, high density lipoproteins. The components of metabolic syndrome were assessed using chi-square test. Data was analysed using SPSS version 13.

RESULTS

During the study period 200 cases were included in the study after taking the informed consent. Among them 100 cases were pre-menopausal and the remaining were post-menopausal. Out of 200 cases, 60 cases were hypertensive (30%), 56 cases had waist circumference more than 88 cm (28%), 16 cases had triglycerides level more than 150 mg/dl (8%) and 4 cases had high density lipoproteins less than 50 mg/dl (Table 1).

Table 1: *Distribution of components of metabolic syndrome other than diabetes.*

Components	Standard value	Cases	Percentage
Hypertension	>130/85	60	30
Waist circumference	>88 cm	56	28
Triglycerides	>150 mg/dl	16	8
High density lipoproteins	< 50 mg/dl	5	2

When distribution of components of metabolic syndrome other than diabetes were analysed, using standard cut off values, following results were obtained.

A total of 68 (34%) cases had only one component of metabolic syndrome in addition to diabetes, 40 (20%) cases had two components of metabolic syndrome, 12 (6%) cases had three components of metabolic syndrome and 4 (2%) cases had all the components of metabolic syndrome. Thus 28% of the cases had two or more components of metabolic syndrome in addition to diabetes. According to ATPIII guidelines 28% cases in our study had metabolic syndrome (table 2).

Table 2: *Distribution of number of components of metabolic syndrome.*

Number of components	Cases	Percentage
1.	68	34%
2.	40	20%
3.	12	6%
4.	4	2%

When distribution of the number of components of metabolic syndrome in pre-menopausal group (group 1) was analyzed using standard cut off values following results were obtained. Out of 100 cases in group 1 nine cases (9%) had only one component of metabolic syndrome in addition to diabetes. Five cases (5%) had two components of metabolic syndrome present. Two cases (2%) had three components of metabolic syndrome. None had all components of metabolic syndrome. Thus 7% cases in group 1 had metabolic syndrome (table 3).

Table 3: *Distribution of number of components in pre-menopausal group.*

Number of components	Cases in group 2	Percentage
1.	9	9%
2.	5	5%
3.	2	2%
4.	0	0

When distribution of the number of components of metabolic syndrome in post-menopausal group (group 2) was studied, out of 100 females, 25% had only one component of metabolic syndrome, 15% had two components of metabolic syndrome, 4% had three and 2% had all components of metabolic syndrome. Thus 21% post-menopausal females had metabolic syndrome (Table 4).

When comparison of components of metabolic syndrome in two groups was made, it was found that 16% cases in group 1 and 46% cases in group 2 had one or more components of metabolic synd-

Table 4: *Distribution of number of components in post-menopausal group.*

Number of components	Cases in group 2	Percentage
1.	25	25%
2.	15	15%
3.	4	4%
4.	2	2%

Table 5: *Comparison of number of components of metabolic syndrome in two groups.*

Number of components	Cases in group 1	Cases in group 2
1.	9%	25%
2.	5%	15%
3.	2%	4%
4.	0	2%
Total	16%	46%
Metabolic syndrome	7%	21%

Chi-square = 6.14, p = 0.01

rome in addition to diabetes. On further analysis it was observed that 21% females in group 2 had metabolic syndrome, on the other hand 7% females in group 1 had metabolic syndrome. Thus group 2 had significant value for the metabolic syndrome as compared to group 1. (Chi-square = 6.14, p = 0.01).

DISCUSSION

The early diagnosis and prompt treatment would prevent the increasing morbidity and mortality due to complications of metabolic syndrome e.g. ischaemic heart disease, stroke, dementia, non-alcoholic steatohepatitis, polycystic ovarian disease, haemochromatosis and acanthosis nigricans.[1] We have studied metabolic syndrome in the diabetics due to the reason that the glucose intolerance and insulin resistance is one major cause and an important component of metabolic syndrome. According to Reaven, insulin resistance is the underlying factor and named the metabolic syndrome as syndrome X.[4] Metabolic syndrome has been a favourite subject of scientists and is still under research, thus new horizons are opened every day. There are two widely accepted definitions of metabolic syndrome which are regularly reviewed and up dated.[5] According to World Health Organization Classification following parameters should be present:[6]

- Blood pressure > 140/90 mmHg.
- Triglycerides > 1.695 mmol/l.
- High density lipoproteins < 0.9 mmol/l.
- Central obesity-waist hip ratio > 0.9 (males), 0.85 (females)
  Or body mass index > 30 kg/m^2
- Microalbuminuria.
  Urinary albumin excretion ratio >20 mg/min.
  Albumin: creatinine > 30.

The National Cholesterol Education Program Adult Treatment Panel III has suggested a different criterion for detection of metabolic syndrome which is regularly updated and we have used that criterion. A study comparing two different definitions of metabolic syndrome showed two different prevalence rates in USA. It was 23.9% prevalence of metabolic syndrome according to ATPIII guide lines whereas it was 25.1% prevalence according to WHO guidelines.[7] According to our study by using ATPIII guide lines 28% diabetic females, coming to outpatient diabetic clinic in a teaching hospital had metabolic syndrome. Among them 21% were post-menopausal and 7% were pre-menopausal. In USA, 23.9% females and 21% males had metabolic syndrome.[8] In another study on Arab-Americans the prevalence of metabolic syndrome was reported as 23%. In that study ATP111 guide lines were used.[9] The most important components in that study group were glucose intolerance (diabetes) and dyslipidaemia. Study showed the diabetes 64% and dyslipidaemia 59.6% in study participants.[9] In a study in Oman, prevalence of metabolic syndrome was 21%, with 19.3% males and 23% females.[10] In that study obesity and dyslipidaemia were the major components.

A study carried out in Pakistan in 1999, reported the 2.7% prevalence of metabolic syndrome. However this study did not follow the ATPIII guidelines to define metabolic syndrome.[11] Still this was an eye opener for us that the problem of metabolic syndrome was increasing in magnitude and had attained the same level as mentioned in international studies. It had emerged as a health problem in a few years in our community. Thus serious efforts should be made to create awareness about this problem.

In our study hypertension and obesity were the major components of metabolic syndrome. It was found to be 30% and 28% respectively. The process of atherosclerosis is increased in diabetes and plays an important role in hypertension and ischaemic heart diseases. Wajchenberg described the association of diabetes, hypertension, obesity and hyperlipidaemia as metabolic syndrome.[12] It was the second major component in our study. Obesity occurred due to development of abdominal and visceral fat as a result of lack of physical activity and high caloric intake. There are many

studies that showed relationship of obesity with metabolic syndrome.[13] A model for the development of metabolic syndrome was proposed to be an experiment with rats that were fed on high sucrose diet. Sucrose in that model induced fat accumulation and ultimately resulted in metabolic syndrome.[14]

In an international study, researchers made an interesting study that upper body obesity predisposed to diabetes, atherosclerosis, hypertension gout and calculi. They called them a syndrome.[15] Similarly in a study, the term metabolic syndrome was used for the association of obesity and diabetes as the risk factors for atherosclerosis which can be prevented by life study modifications.[16] Another international study described six obese cardiac patients with diabetes, hypertension, hyper cholesterolemia and marked hyper-triglyceridaemia, all of them improved when the patient was put on a hypocaloric and low carbohydrate diet.[17] Thus all components of metabolic syndrome are preventable by simple life style modifications and creating awareness.

Another important finding in our study was that 21% of post-menopausal females had metabolic syndrome as compared to 7% in pre-menopausal group. That could be explained on two important factors. First was sex hormones and second factor was aging process. In post-menopausal females the sex hormones were disturbed due to the fact that there is deficiency of ovarian steroid hormone production. Those hormones are progesterone and oestrogen. The deficiency of oestrogen leads to an increase in atherosclerosis of blood vessels causing hypertension.[18] Moreover those hormones affect the metabolism of fats and lipoproteins leading to obesity. Thus we could easily explain that the post-menopausal females are at greater risk of development of metabolic syndrome. In our study, same was true when we compared the pre and post-menopausal females for the presence of metabolic syndrome. In another study, sex hormones were hypothesized to be related to dyslipidaemia, diabetes, hypertension and atherosclerosis.[19] Phillips gave the concept that the risk factors of myocardial infarction like dyslipidaemia, diabetes, hypertension, atherosclerosis, aging and obesity had a linking factor, called sex hormones and their knowledge would lead to prevention of many diseases.[20]

The impact of metabolic syndrome was explained by Roger in kidney pancreas transplant. In a total of 241 patients 59% had metabolic syndrome pretransplantation. Presence of metabolic syndrome at 1 year was associated with long term renal dysfunction after kidney-pancreas transplantation.[21] In another study, operative mortality after CABG surgery was 2.4% in patients with metabolic syndrome and 0.9% in patients without it (p= 0.0001). The metabolic syndrome was a strong independent predictor of operative mortality, relative risk 3.04, 95% confidence interval 1.73-5.32, p=0.0001. After adjusting for other risk factors, the risk of mortality was increased 2.69 folds, p=0.007 in patients with metabolic syndrome, whereas not significantly increased in patients with diabetes and no metabolic syndrome.[22]

Thus metabolic syndrome is an important health issue in this modern era. All efforts should be taken to create awareness, early diagnosis and prevention. Control of all components of metabolic syndrome is possible and this will decrease the burden on our limited health resources by preventing complications like stroke, ischaemic heart disease and death. Life style modifications are most important in preventing metabolic syndrome.[23] Various strategies have been proposed. These include increased physical activity such as walking thirty minutes every day and a healthy reduced calorie diet. One of such studies included 2375 subjects over twenty years and suggested that the daily intake of a pint of milk or equivalent dairy products more than halved the risk of metabolic syndrome.[24] The International Obesity Task Force states that interventions on a sociopolitical level are required to reduce the development of metabolic syndrome in any population.[25]

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