Frequency of Metabolic Syndrome among Type 2 Diabetic Patients.

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Abstract:

Background: The metabolic syndrome (MS) is a cluster of metabolic abnormalities that occur together in an individual more often than might be expected by chance.

Aim of the study: The aim of this study is to identify the frequency of metabolic syndrome among patients with type 2 diabetes .

Methodology: This cross-sectional study was conducted at Baghdad Medical city (Medical consultation department, and Teaching Laboratories), 100 Sample(males: 41; females: 59) 66 patients (66%) diagnosed as having metabolic syndrome, while the remaining 34 patients (34%) did not have metabolic syndrome were included in the study. In order to measure Fasting serum glucose, Lipid profile (Triglyceride, HDL), blood Pressure and waist Circumference. When the disease was compared between patients with metabolic and non-metabolic syndrome, a highly significant (P value < 0.001) was observed in the clinical and biochemical data of patients with metabolic and non-metabolic syndrome in (glucose, Triglyceride, blood Pressure and waist Circumference), but a non-significant change in HDL levels, and significant increase(P value < 0.01) was observed in the characteristics of type 2 diabetic patients with metabolic syndrome (age, sex, Duration and family history) .

Conclusion : Metabolic syndrome frequency is high (66%) among type 2 diabetic patients.

Keywords: glucose , Triglyceride, waist Circumference, metabolic syndrome.

Introduction

The metabolic syndrome (MS) is a cluster of metabolic abnormalities that occur together in an individual more often than might be expected by chance, a metabolic disorder characterized by insulin resistance, Diabetes Mellitus (DM), obesity, dyslipidemia and hypertension[1]. The syndrome has gained the interest and concern of physicians and patients because it represents a collection of several conditions and risk factors that lead to acceleration of cardiovascular diseases with insulin resistance [2]. The metabolic syndrome has had a variety of names, such as the Deadly Quartet, Syndrome X plus, dysmetabolic syndrome, and other names, usually given when other components are added apart from the key components of glucose intolerance, hyperinsulinemia/insulin resistance, central obesity, dyslipidemia, and hypertension[3]. Metabolic syndrome is quite common. Approximately 20-30% of the population in industrialized countries have metabolic syndrome[4]. A report derived from the National Health and Nutrition Examination Survey database (NHANES) [5,6] assessed the frequency of the metabolic syndrome is increasing in the US population. The age adjusted frequency of the metabolic syndrome among adults in the United States was estimated at 23.7% in non- diabetic and rising to 45.2% in type 2 diabetic patients. Rates were higher in female sex and increased with age, and the diagnosis of metabolic syndrome according to National Cholesterol Education Program (NCEP) criteria was based on the presence of 3, 4, and 5 diagnostic components in 70%, 27%, and 3% of subjects, respectively. Hypertension was the most frequent individual contributor to the diagnosis of metabolic syndrome (81% of patients) and fasting glucose ≥100 mg/dL was the lesser one (18% of patients) [6]. In the system puts person at risk for other health consequences. The levels of cholesterol and triglyceride-another blood fat- in the blood stream may increase, causing damage to the coronary arteries[7]. And excessively high insulin levels may interfere with the kidney ability to process salt, which can raise the blood pressure. The cause of insulin resistance is not well understood, but it probably involves a variety of genetic and environmental factors. Doctors believe that some people are genetically predisposed to insulin resistance, and the tendency may be partly inherited. But being overweight and inactive are major contributors [8].

Aim of the study:

The aim of this study is to identify the frequency of metabolic syndrome among patients with type 2 diabetes .

Methodology

This cross-sectional study was conducted at Baghdad Medical city (Medical consultation department, and Teaching Laboratories), during the period from June 2015 to February 2016. A total of 100 patients(males: 41; females: 59)with type 2 diabetes were included in this study to identify the frequency of metabolic syndrome among them. After the application of National Cholesterol Education Program (NCEP) criteria to diagnose metabolic syndrome (that consider 3 or more diagnostic criteria of metabolic syndrome) as shown in table (1).

The subjects were grouped as metabolic syndrome or not according to the criteria that indicated by experts of the National Cholesterol Education Program (NCEP) -Adult Treatment Panel (ATP) [6,9]. Patients with 3 or more criteria were considered to have metabolic syndrome. A Pre-tested questionnaire, measurement and investigation was designed to obtain information about age, gender, height, weight, Fasting serum glucose, Lipid profile (Triglyceride, HDL), past medical history, social history, family history, blood Pressure and waist Circumference. the exclusion criteria were patients with chronic

diseases other than diabetes and hypertension, insulin therapy, recent infection, thyroid dysfunction, pregnancy, and the use of oral contraceptive drugs. Serum estimation using spectrophotometric method includes Procedure was performed according to the pipetting scheme provided by the kit. Data were collected and analyzed using SPSS version 10.0 by p-value <0.05.

Results

The differences in number needed to diagnose metabolic syndrome in the studied sample MP (66 patients) is presented in figure (1). 15 of 66 patients (23%) had three criteria, 36 of 66 patients (54%) had four criteria, and the remaining 15 of 66 patients (23%) had five criteria The mean value ± SD of patients with metabolic and non-metabolic syndrome respectively is shown in table (2). The results show a highly significant changes (elevation) of glucose at ($p<0.001$) in comparison of patients with metabolic and non-metabolic syndrome. Significant elevation of Triglyceride at ($p<0.001$) in comparison of patients with metabolic and non-metabolic syndrome, as that high Significant changes of blood Pressure at ($p<0.001$) when comparison of patients with metabolic and non-metabolic syndrome, and highly significant in waist Circumference at ($p<0.001$) in comparison of patients with metabolic and non-metabolic syndrome. However a non-significant increase ($p>0.35$) of HDL levels when comparing between metabolic and non-metabolic syndrome .

The characteristics of type 2 diabetic patients with metabolic and non-metabolic syndrome are presented in table (3). The mean age in years was higher in the Metabolic Patients (49.3 years) than the Non-Metabolic Patients (43.4 years) and the difference was statistically significant, (P value< 0.01). Regarding the frequency of metabolic syndrome among the sex different groups, 47 out of 66 (71%) were females and 19 (29%) were males in Metabolic Patients; whereas in Non-Metabolic Patients 12 out 34 (35%) were females and 22 (65%) were males, the difference was significant (P value < 0.001). The mean Duration of type 2 diabetes (in months) was higher in Metabolic Patients (52.3 months) than Non-Metabolic Patients (13.4 months). The difference between these two results was statistically highly significant, (P value < 0.001). Positive family history of 1st degree relative of diabetes was higher in Metabolic Patients [50 of 66 patients (75.8%)], while it was [18 of 34 patients (53%)] in Non-Metabolic Patients. The difference was statistically significant, (P value < 0.05).

Table (1) The NCEP-ATP Current Criteria for the Diagnosis of Metabolic Syndrome that Considered in this Study[9].

Criteria	NCEP-ATP111
Hypertension	BP medication or BP>130/85 mm/Hg.
Dyslipidemia	Plasma triglycerides >150 mg/dl, HDL cholesterol <40 mg/dl in male and <50 mg/dl in female.
Obesity	Waist circumference >40 inches (>102 cm) in male and >35 inches (>88 cm) in female.
Glucose	Fasting blood glucose >100 mg/dl.
Requirements for diagnosis	Requires any 3 of the above disorders.

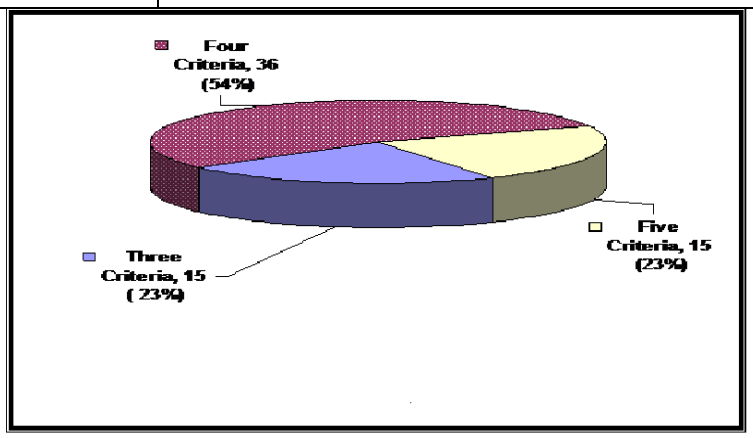

Figure (1): The Difference in number of Diagnostic criteria of metabolic patients.

Table (2) The mean biochemical data (NCEP Criteria) of patients with metabolic and non-metabolic syndrome.

	Metabolic 66 patients	**Non-Metabolic** 34 patients	**P-Value**
	Mean ± SD	Mean ± SD	
Fasting S. Glucose mg/dl	146.8 ± 34	104.7 ± 22	< **0.001**
S. Triglyceride mg/dl	178.2 ± 29	139.6 ± 27	<**0.001**
Waist Circumference cm	117.9 ± 11	107.7 ± 11	< **0.001**
Elevated Blood Pressure, n (%)	48(73%)	3(9%)	< **0.001**
S. HDL mg/dl	48.1 ± 10	49.9 ± 8	= **0.35**

Table (3)The characteristics of type 2 diabetic patients with metabolic and non-metabolic syndrome.

		Metabolic 66 patients	**Non-Metabolic** 34 patients	**P Value**
		Mean ± SD	Mean ± SD	
Age (years)		49.3 + 9.5	43.4 + 7.8	< 0.01
Sex	Male n(%)	19 (29%)	22 (65%)	**< 0.001**
	Female n (%)	47 (71%)	12 (35%)	
Duration (months)		52.3 ±24.9	13.4 ± 5.9	< **0.001**
+ve Family History n (%)		50 (75.8%)	18 (53%)	< **0.05**

Discussion

In this study, the frequency of metabolic syndrome was found to be increased in patients with longer duration type 2 diabetes and the presence of positive family history of diabetes among 1st degree relatives, and duration of diabetes is an important parameter as diabetes is progressive disorder in most of patients [10]. Mean fasting serum glucose was higher in this study in Metabolic Patients (146 mg/dl) than in Non-Metabolic Patients (104.7 mg/dl) (P value < 0.001). Elevated fasting glucose is one of the NCEP criteria of metabolic syndrome diagnosis. These results reflect the state of poorly controlled diabetes among the Metabolic Patients, as [60 of 66 patients (91%)] of Metabolic Patients had elevated fasting glucose compared to only [8 of 34 patients (24%)] in Non-Metabolic Patients who had elevated fasting glucose. The problem of insulin resistance – as measured by elevated serum fasting glucose in this study – was found to be significantly associated with increasing age, female sex, longer diabetes duration, dyslipidemia, hypertension, and obesity. So according to the results of this study, poor control of diabetes of the patients can be blamed for an enormous participation in metabolic syndrome development. Such findings concerning this aspect were in agreement to what declared by many other researchers [5, 11-13]. Grundy in United States in 2004 affirmed that dyslipidemia on insulin resistance is characterized by elevated levels of plasma triglyceride and low levels of HDL [14]. In this study, the results were in concurrence with the results of Grundy in United States. Mean serum triglyceride was higher in Metabolic Patients than in Non-Metabolic Patients (P value < 0.001). Although the mean serum HDL level was low in type 2 diabetic patients, the difference between HDL level in Metabolic Patients and Non-Metabolic Patients was statistically not significant (P value = 0.35). This insignificant findings concerning HDL level can be attributed to that both Metabolic Patients and Non-Metabolic Patients had already type 2 diabetes, and diabetes could play a role in lowering HDL level in both groups equally through the loss of regulatory role that insulin has on fat metabolism[15, 16]. Also the irrelevant results can be due to small study population (100 patients with type 2 diabetes) compared to large multicentric studies abroad. Raji and his followers in United States 2003[17].found that hypertension occurs in up to one third of type 2 diabetic patients with metabolic syndrome. In this study, the results showed that hypertension was present in [48 of 66 patients (73%)] in Metabolic Patients. This difference can explained by most of patients in Raji study were euglycemic – due to good control of their diabetes – in contrast to study patients (91% had elevated serum fasting glucose), and insulin resistance has been directly tied to the development of hypertension and other abnormalities of vascular barriers. Additionally, increased insulin levels may increase sympathetic nervous system activity and sodium retention [17, 18]. Isezuo and Ezunuconducted a cross-sectional study on type 2 diabetic patients with metabolic syndrome in Nigeria 2005[19]. They found that obesity – measured by waist circumference – was present in (42.5%) of patients. In Sudia Arabia in 2002, the percent of obesity among type 2 diabetic patients with metabolic syndrome was (67.7%) [20]. Central obesity according to this study was present in [65 of 66 patients (98.5%)] in Metabolic Patients. Such a result denotes a serious health problem to type 2

diabetic patients in our population as most of them are obese. In regard to the [34 of 100 patients (34%)] with type 2 diabetes in this study who did not have metabolic syndrome, we noticed that the most important protective parameter against the development of metabolic syndrome among them was good control of their diabetes (FBG≥100 mg/dl) as only [8 of 34 patients (24%)] of them had elevated fasting serum glucose. Insulin resistance has a poor impact of fat metabolism as it can lead to increase in triglyceride level and decrease in HDL level. Also it is considered one of the leading factors in the development of hypertension in type 2 diabetes. Controlling of serum glucose can eventually lead to decrease in insulin resistance and its subsequent harmful effects [17,18 and 21].

Conclusion

Metabolic syndrome frequency is high (66%) among type 2 diabetic patients. Those patients have unsatisfactory situation as most of them have obesity, dyslipidemia, uncontrolled diabetes, and hypertension. Metabolic syndrome occurrence is significantly increased with age, female sex, longer duration of diabetes, and positive family history of diabetes among type 2 diabetic patients.

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