Prevalence of Metabolic Syndrome among Hypertensive Patients Attending a Primary Care Clinic in Kuwait

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Key Words

Metabolic syndrome · Waist · Triglycerides ·
Insulin resistance · Primary care

Abstract

Objective: To determine the prevalence of metabolic syndrome among hypertensive patients using the criteria of the National Cholesterol Education Program's Adult Treatment Panel III in a primary care health center in Kuwait. **Subjects and Methods:** A population of 250 Kuwaiti hypertensive patients (129 males and 121 females) over the age of 40 were screened for metabolic syndrome by determining body mass index (BMI), waist circumference, levels of fasting plasma glucose and fasting plasma lipids (serum triglycerides, total cholesterol and high-density lipoprotein cholesterol). The study was carried out in the Mishref Family Practice Health Center, Kuwait, from January to July 2001. **Results:** The total number of patients who met the criteria for metabolic syndrome was 85 (34%), 55% of them were males and 45% females. Prevalence of the syndrome was 28.2% among 40- to 55-year-olds and 41.9% in those above the age of 55 years. Among the 250 hypertensive patients,

type II diabetes mellitus was found in 52.8% (54% males and 46% females), impaired fasting glucose in 8% (70% males and 30% females), high plasma triglycerides in 44.8% (53% males and 47% females) and low high-density lipoprotein cholesterol in 63.2% (54% males and 46% females). Obesity measured as BMI = 30 kg/m² was noted in 46% (43% males and 57% females) and increased waist circumference in 58% (44% males and 56% females). **Conclusion:** The prevalence of metabolic syndrome is high among hypertensives attending primary health care centers in Kuwait.

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Introduction

Metabolic syndrome is characterized by a constellation of multiple risk factors that include obesity, physical inactivity and genetic factors [1, 2]. The syndrome is closely associated with a generalized metabolic disorder in which there is a defect in insulin action at the cellular level in the form of impaired responsiveness to endogenous and exogenous insulin (insulin resistance) [3, 4]. Other risk factors include hyperinsulinemia, atherogenic dyslipidemia, and

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1011-7571/04/0131-0039\$21.00/0

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Table 1. Criteria for diagnosing metabolic syndrome (three or more of the risk factors) according to the National Cholesterol Educational Program's ATP III criteria [5]

Risk factor	Defining level
Abdominal obesity	waist circumference
Men	> 102 cm (>40 inches)
Women	> 88 cm (>35 inches)
TG	150 mg/dl
HDL-C	
Men	< 40 mg/dl
Women	< 50 mg/dl
Blood pressure	130/85 mm Hg
Fasting glucose	> 110 mg/dl

high blood pressure. According to the National Cholesterol Education Program of Adult Treatment Panel III (ATP III) guidelines for identifying the syndrome [5], the diagnosis of metabolic syndrome is based upon the demonstration of three or more of the components shown in table 1. In addition to the criteria in table 1, the WHO recommends demonstration of microalbuminuria, hyperuricemia, raised levels of plasminogen activator inhibitor-1, and raised fasting insulin level, which is taken as evidence of insulin resistance.

Insulin is a major anabolic regulator of carbohydrate, protein and lipid metabolism and hence is a major growth factor. It stimulates the uptake of amino acids by various cells promoting protein synthesis and inhibiting gluconeogenesis. It also stimulates glucose uptake and its conversion to glycogen. Furthermore, it promotes the synthesis of triglycerides (TG) and its storage as neutral fat. In metabolic syndrome, excess insulin promotes fat storage with consequent weight gain, which is characteristically abdominal. The weight gain in turn further increases insulin resistance, leading to the various abnormalities in plasma glucose and lipids [6, 7]. The causal relationship of the syndrome to hypertension is not clear, but probably relates to the hemodynamic consequences associated with obesity and hyperinsulinemia.

The syndrome has generated much concern over the past few years because it clearly represents a high risk for developing coronary artery disease and cardiovascular events [8, 9]. The aim of this study was to determine the prevalence of this high risk condition in a population of hypertensive patients attending primary health care.

Subjects and Methods

A total of 250 Kuwaiti hypertensive patients (129 males and 121 females) above the age of 40 attending the Mishref Family Practice Health Center in Kuwait for follow-up management were screened for the presence of metabolic syndrome from January to June 2001. The patients were randomly chosen on an assigned day, with an average of 10 cases per week. A special form, which included personal data, history of type II diabetes mellitus, measurements of body mass index (BMI), waist circumference, fasting plasma glucose and fasting lipid profile (TG, total cholesterol, high-density lipoprotein cholesterol, HDL-C) was used for data collection. The diagnosis of metabolic syndrome was based on the ATP III criteria [5]. ATP III criteria were chosen over others [10] including those of WHO because their application facilitates diagnosis of metabolic syndrome, particularly at the level of primary health care.

A patient was considered obese if BMI was $\geq 30 \text{ kg/m}^2$, and a diagnosis of abdominal obesity was made when the waist circumference exceeded 102 cm (40 inches) in males and 88 cm (35 inches) in females [11]. Hypertriglyceridemia was considered when the fasting (12–14 h) plasma TG was equal to or exceeded 150 mg/dl (1.70 mmol/l) for both males and females. Low HDL-C was determined when the plasma level was less than 40 mg/dl (1.04 mmol/l) for males and 50 mg/dl (1.3 mmol/l) for females, and hypercholesterolemia was diagnosed when the plasma total cholesterol exceeded 199.6 mg/dl (5.2 mmol/l) for both males and females. Diabetes mellitus and impaired fasting glucose were diagnosed in accordance with the American Diabetes Association guidelines [12, 13].

All laboratory tests were done in Mubarak Al-Kabeer Hospital using the Synchron-LX20 clinical System (Beckman, Brea, Calif., USA, 1997). The data were analyzed using the Statistical Package of Social Study SPSS Version 11.0. The p value was derived using the Z-normal test.

Results

Of the 250 hypertensive patients, 85 (34%) met the ATP III guidelines for diagnosis of metabolic syndrome. The prevalence of each of the five ATP III criteria for diagnosis of metabolic syndrome is shown in table 2. The criteria with the highest prevalence was reduced high density lipoproteins (63.2%), while the lowest was that of impaired fasting blood sugar (8%). Type II diabetes mellitus and impaired fasting glucose were seen in 52.8 and 8% of subjects, respectively. High plasma total cholesterol was found in 55.2%, while low HDL-C was detected in 63.2% of the screened population. Raised plasma TG was found in 44.2%, and increased waist circumference was seen in 58%. The differences between males and females for impaired fasting blood glucose and increased waist circumference were statistically significant ($p < 0.05$), while the differences between genders for the remaining criteria were not statistically significant.

Table 2. Prevalence of each of the ATP III criteria for diagnosis of metabolic syndrome among the screened population (n = 250)

Criteria	Total subjects, n (%)	Males n (%)	Females n (%)	p value
Type II diabetes mellitus	132 (52.8)	70 (54.2)	62 (51.2)	NS
Impaired fasting blood glucose	20 (8)	14 (10.8)	6 (4.9)	<0.05
Increased waist circumference	145 (58)	57 (44.1)	88 (72.7)	<0.0001
Elevated plasma TG	112 (44.8)	59 (45.7)	53 (43.8)	NS
Reduced high-density lipoproteins	158 (63.2)	82 (63.5)	76 (62.8)	NS

The prevalence of patients with and without metabolic syndrome by gender is shown in table 3, and the difference between males and females was statistically significant ($p < 0.05$). The prevalence of metabolic syndrome was 28.2% for those aged 40–55 years and 41.9% for those above the age 55 years. The prevalence of metabolic syndrome among different age groups with and without metabolic syndrome is shown in table 4, and the difference between the age groups is statistically significant ($p < 0.012$).

Discussion

The prevalence of metabolic syndrome (34%) in this study was remarkably high, probably because ATP III instead of ATP II criteria [14] were used for the analysis. According to the newer ATP III criteria, low HDL-C is defined as <40 mg/dl (1.04 mm/l) for males and <50 mg/dl (1.30 mm/l) for females, while the older ATP II criteria defined low HDL-C as <35 mg/dl (0.91 mm/l) [14]. When ATP II criteria were applied, the prevalence rate of metabolic syndrome in the current study decreased to 16%, similar to the 17% prevalence reported by WHO in an earlier study, also using the older guidelines [15]. Thus it appears that the difference in strictness between ATP II and ATP III criteria might in part account for our finding of 34% prevalence.

A recent study by Ford et al. [16] using ATP III criteria reported unadjusted and age-adjusted prevalence rates of metabolic syndrome of 21.8 and 23.7%, respectively, which is lower than the 34% prevalence rate of this study. Therefore use of ATP III instead of ATP II criteria may not adequately explain the high rate of prevalence of metabolic syndrome observed in this study. The other plausible explanation is the high prevalence of risk factors such as type II diabetes mellitus, increased waist circumference, elevated plasma TG and reduced high-density lipoprotein observed in this study (table 2). This view is supported by the close association between hypertension and diabetes mellitus as reported by the American Diabetic Association in which up to 68% diabetics were also hypertensive [12].

Table 3. Prevalence of patients with and without metabolic syndrome by gender

Gender	Metabolic syndrome, n (%)	Without metabolic syndrome, n (%)	p value
Male	37 (43.5)	92 (55.7)	<0.05
Female	48 (56.4)	73 (44.2)	<0.05
Total	85 (100)	165 (100)	

Table 4. Prevalence of patients with and without metabolic syndrome by age

Age group	With metabolic syndrome, n (%)	Without metabolic syndrome, n (%)	Total
Age = 40–55	41 (28.2)	104 (71.7)	145
Age = 55	44 (41.9)	61 (58.0)	105
p value	<0.012	<0.012	

In most cases improper nutrition and inadequate physical activity are the root causes of the syndrome and as such it has been strongly recommended that a healthy lifestyle be adopted that includes weight control [17] and increased physical activity [18–20]. This recommendation is crucial because despite the availability of many medications that can control hypertension, blood sugar and lipids, there is no effective pharmaceutical treatment for raising low HDL-C level. Thus, al-

though the ATP III guidelines aid in diagnosis of metabolic syndrome, management, to some degree, remains a problem. More studies are needed to identify the syndrome not only in hypertensive subjects, but also in the general population.

Conclusion

Metabolic syndrome is highly prevalent among hypertensive subjects attending primary health care in Kuwait and therefore we recommend that general practitioners should be aware of this syndrome and should use the ATP III criteria to facilitate the diagnosis of this high risk condition.

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