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Muthanna Medical Journal
2019; **6**(2):60-72

Metabolic syndrome associates with Ischemic heart disease: cross sectional study in Al-Hussein teaching hospital

Hassan Abdul Amir Al-Daghir

Abstract

We tried to verify the incidence of metabolic syndrome in cases which are admitted into coronary care unit, their most common presentations and how to deal with so as to reduce squeals and to decrease incidence of recurrence. We studied our cases by gender, age groups, presentation (whether unstable angina or myocardial infarction), sudden cardiac death, sleep apnea, serum uric acid, smoking, socioeconomic status, lipodystrophy, poly cystic ovaries, peripheral arterial disease, stroke, family history, diabetes mellitus, hypertension and lipid profile. We found 150 out of 250 cases studied (60%) fulfilling criteria of metabolic syndrome according to European society of cardiology, European society of hypertension consensus definition and in these metabolic syndrome cases DM was found in 76 (50.66), hypertension in 88 (58.66), obesity in 114 (76%), low high density lipoprotein in 140 (93.33%) and high serum triglyceride in112 (74.66%) of cases. In conclusions, metabolic syndrome is commonly found in cases admitted into Samawah CCU (both with unstable angina and acute myocardial infarction). All elements of Mets (hypertension, diabetes mellitus, obesity, low HDL, high STG) are commonly found in our cases so we should deal with all these parameters in a meticulous way as a primary care and for secondary prevention so as to reduce the incidence of ischemic heart diseases and their complications.

Key words: Metabolic syndrome; Unstable angina; Myocardial infarction; Peripheral arterial disease

* Correspondence author: haldaghir@yahoo.com
Al-Hussein teaching hospital /coronary care unit, Samawah/ Iraq
Received 21 July 2018, Accepted 13 October 2019, Available online 30 October 2019

Introduction

Metabolic syndrome, also known as Insulin Resistance Syndrome (IRS) and Syndrome X, is a cluster of metabolic and anthropometric traits including glucose intolerance, upper body fat distribution (increased intra-abdominal fat mass), hypertension, dysfibrinolysis, and a dyslipidemia (characterized by high triglycerides, low high-density lipoprotein [HDL] cholesterol, and small dense low-density lipoprotein [LDL] particles) [1]. Metabolic syndrome constitutes a powerful risk factor complex to identify individuals at increased risk for future

Type 2 diabetes and cardiovascular disease (CVD). Insulin resistance and abdominal obesity are two central components of the syndrome and are integrally involved in its pathogenesis [2]. Insulin resistance is a metabolic abnormality in which peripheral tissues exhibit a subnormal biologic response to the glucose-lowering action of insulin. Insulin resistance not only antedates the development of diabetes but is also a major metabolic defect (together with impaired insulin secretion and elevated hepatic glucose production) that maintains hyperglycemia in patients with overt disease [3]. The central role of abdominal adiposity underscores the importance of body fat distribution regarding the metabolic consequences of obesity. Individuals with metabolic syndrome are also more prone to develop other pathologic conditions including polycystic ovary syndrome, non-alcoholic steatohepatitis (NASH), cholesterol gallstones, sleep disorders, and some types of cancer [4]. Thus, metabolic syndrome is responsible for a tremendous burden of human disease and social costs, and nutritional therapy is key to both its prevention and limiting its progression to Type 2 diabetes and cardiovascular degasses [5].

More definitive evidence that metabolic syndrome per se predisposes to coronary heart disease and cerebrovascular disease has been reported [6]. Thus a twofold to fourfold increase in subsequent cardiovascular events has been described in men and women with metabolic syndrome (modified WHO criteria) even in the absence of type 2 diabetes or impaired glucose tolerance [7]. Qualitatively, similar results have been obtained when metabolic syndrome was defined by ATP III criteria. In a compilation of multiple studies, the presence of metabolic syndrome had a greater impact on the risk for developing diabetes (fivefold) than ASCVD (twofold) [8]. In addition, where studied, the rate of cardiovascular events was higher in patients who had diabetes and metabolic syndrome than in individuals with only metabolic syndrome [9].

Materials and Methods

We studied our cases by gender, age groups, presentation (whether UN or MI), sudden cardiac death, sleep apnea, serum uric acid, smoking, socioeconomic status, lipodystrophy, poly cystic ovaries, PAD, stroke, family history, diabetes mellitus, hypertension and lipid profile.

Results

We studded 250 cases of IHD whom admitted into CCU during the period from January to July 2018 and the results as follow:

Table 1.

Total cases studied regarding gender and age factors

Total cases studied	male	female	20 -30 years	31 -40 years	41 -50 years	51 -60 years	61 -70 years	71 -80 years	81 -90 years
250	138 (55.2)	112 (44.8)	0 (0%)	18 (7.2%)	46 (18.4%)	74 (29.6%)	58 (23.2%)	42 (16.8%)	12 (4.8%)

Table. 2

Total cases studied regarding incidence and type of IHD

Stable angina	Unstable angina	Acute myocardial infarction
0 (0%)	122 (48.8%)	128 (51.2%)

Table. 3

Total cases studied and prevalence of Mets Components

Diabetic patients	90 (36%)
Non Diabetic patients	160 (64%)
Elevated systolic blood pressure	92 (36.8%)
Elevated diastolic blood pressure	58 (23.2%)
Elevated both systolic and diastolic blood pressure	54 (21.6%)
Normal LDL	148 (59.2%)
High LDL	102 (40.8%)
High HDL	16 (6.4%)
Low HDL	234 (93.6%)
High TG	112 (44.8%)
Normal TG	138 (55.2%)
Obesity	147 (58.8%)
Non obesity	103 (41.2%)

Table. 4

Total cases studied regarding risk factors, complications and associated conditions

Sudden cardiac death	0 %
Sleep apnea	4 (1.6%)
High S. uric acid	16 (6.4 %)
Smoking	142 (56.8%)
Low socioeconomic status	121 (48.4 %)
High socioeconomic status	129 (51.6%)
Lipodystrophy	6 (2.4 %)
Polycystic ovaries	2 (0.8%)
Acanthosis Nigerians	0 %
PAD	12 (4.8%)
Stroke	22 (8.8 %)
Negative family history	212 (84.8 %)
Positive family history	38 (15.2%)

150 metabolic syndrome cases out of the total 250 cases studied according to standard definition and our results as follow:

Table 5.

Total cases studied regarding gender and age factors

Total cases studied	male	female	20 - 30 years	31 -40 years	41 -50 years	51 -60 years	61 -70 years	71 -80 years	81 - 90 years
150 (60%)	80 (53.33)	70 (46.66)	0 (0%)	10 (6.66%)	30 (20%)	46 (30.66%)	30 (20%)	28 (18.66%)	6 (4%)

Table 6.

Total cases studied regarding incidence and type of IHD

Stable angina	Unstable angina	Acute myocardial infarction
0 (0%)	74 (49.33%)	76 (50.66%)

Table 7.

Total cases studied and prevalence of Mets Components

Diabetic patients	76 (50.66%)
Non Diabetic patients	74 (49.34%)
Elevated systolic blood pressure	88 (58.66.8%)
Elevated diastolic blood pressure	58 (38.66%)
Elevated both systolic and diastolic blood pressure	58 (38.66%)
Normal LDL	120 (80%)
High LDL	30 (20%)
High HDL	2 (1.33%)
Low HDL	140 (93.33%)
High TG	112 (74.66%)
Normal TG	38 (25.34%)
Obesity	114 (76%)
Non obesity	36 (24%)

Table 8.

Total cases studied regarding risk factors, complications and associated conditions

Sudden cardiac death	0 %
Sleep apnoea	4 (2.66%)
High S.uric acid	10 (0.66 %)
Smoking	66 (44%)
Low socioeconomic status	74 (49.33 %)
High socioeconomic status	76 (50.66%)
Lipodystrophy	0%
Polystic ovaries	0%
Acanthosis nigricans	0 %
PAD	12 (8%)
Stroke	16 (10.66 %)
Negative family history	122 (81.34 %)
Positive family history	28 (18.66%)

Discussion

In our study mild renal impairment is rare in cases dealt with in our CCU and in one study it was accounted that: the different components of the metabolic syndrome are independent risk factors for the development and progression of chronic kidney disease (CKD); hence, patients with metabolic syndrome are significantly more likely to have CKD [10]. Conversely, metabolic syndrome is highly prevalent in patients with ESRD, including among those undergoing maintenance dialysis [11].

Metabolic syndrome was associated with an increased risk of all subtypes of cataract including cortical, nuclear, and posterior subcapsular cataract (PSC) among elderly Australians [12]. In a population of Malay adults in Singapore, a significant association between metabolic syndrome and cataract was also found [13]. While in our cases studied we had not seen cases of cataract [14]. Results from the Paris Prospective Study [5] showed an increased risk of sudden death related to metabolic syndrome in a population of 6678 men but in our cases we had not faced such events [15].

Various elements, resulting from cardiac abnormalities associated with stimulating the sympathetic nervous system, as noted by an increase in heart rate, could explain the increase in incidence of sudden death [16]. In our study nearly all cases of UA and MI whom admitted into CCU and fulfilling the criteria of Mets having all the five components of Mets while in the same study [17] above it was accounted that several studies have suggested that the impact of certain combinations of metabolic syndrome components are more deleterious than others, such as abdominal obesity and elevated TGs [18]. In the other study, however, other result did not find any significant difference in cardiovascular morbidity, mortality risk between the various combinations of metabolic syndrome components [19]. Other data found that certain components by themselves were as predictive of cardiovascular disease as was metabolic syndrome itself [20].

Several recent studies have revealed some very interesting information showed that among diabetic subjects without known coronary heart disease (CHD), the combination of metabolic syndrome components consisting of diabetes plus hypertension plus low HDL cholesterol was associated with an increased risk of coronary events [21]. Other study found three metabolic syndrome component combinations that led to the highest risk of CHD; increased BP and increased glycaemia combined with lower HDL cholesterol; an increase in BP, glycaemia and TGs; increased BP and TGs associated with lower HDL cholesterol [22]. In the IPC population, we found that the most deleterious associations pertaining to all-cause mortality risk were, regardless of definition used, elevated waist circumference, glycaemia and triglycerides and/or BP

In our patients increased pulse pressure was commonly encountered and it was accounted in the same study above [23] that several recent studies have examined the relationships between BP, pulse pressure, arterial stiffness and metabolic syndrome [24]. The rise in pulse pressure, observed in the presence of metabolic syndrome, increases CHD mortality in women and may well be a new metabolic-syndrome component [25]. In untreated hypertensive subjects, the presence of metabolic syndrome leads to an increase in aortic stiffness, as determined by pulse-wave velocity, independently of age and systolic BP, confirming the other data [26]. In Japanese patients with metabolic syndrome, arterial stiffness was not associated with the number of coronary artery lesions. They found that nearly all cases having hyperglycemia, elevated systolic BP and STG so also low HDL and it was declared that two biomarkers, plasminogen activator inhibitor-1 (PAI-1), a fibrinolysis inhibitor, and aldosterone play a role in the development of metabolic syndrome [27]. PAI-1 is expressed largely in visceral adipose tissue rather than in subcutaneous adipose tissue and is inducible by different factors, more or less implicated in the components of metabolic syndrome [28]. Elevated levels of PAI-1 are significantly associated with a progressive increase in glucose, systolic BP and triglycerides. Elevated-aldosterone levels are significantly associated with increased BP and lower HDL cholesterol [29].

Our patients having multiple risk factors in addition to hypertension so we dealt with hypertension in a meticulous way so as to reduce the burden on the patients and in one study [30]. It was said that the data pertaining to the risk associated with metabolic syndrome were taken into account for the new European recommendations for the management of BP [22]. In these new recommendations, metabolic syndrome is included in the risk stratification in the same manner as is the presence of three or more of the more traditional risk factors (age, tobacco, dyslipidemia, heredity) and subclinical target organ disease (cardiac, arterial, renal) and is at the same level of importance as the presence of diabetes [23]. Biotherapy is recommended as first-line antihypertensive treatment for high risk hypertensive subjects, but the use of beta blockers, especially with a thiazide diuretic is not advised in patients with metabolic syndrome [24].

Atrial fibrillation was not rare in our studied cases and it was established that metabolic syndrome is associated with risk of atrial fibrillation. In the IPC population, metabolic syndrome is more frequent among subjects with atrial fibrillation than among those without and, even more so, among women than among men: 34.2% versus 7.7% in women, 19.3% versus 10.9% in men. Metabolic syndrome is a risk factor for atrial fibrillation as shown in a large prospective observational study. In addition to the metabolic syndrome components known to increase the incidence of atrial fibrillation (hypertension, obesity, hyperglycemia), other factors, such as an increase in pulse pressure, hypertrophy and alterations in left

ventricular diastolic function, atrial dilation and sleep apnoea may also be contributing factors [25].

In one study there was an interesting idea saying that: vascular dysfunction, including that caused by endothelial dysfunction, is an early abnormality in the metabolic syndrome that may contribute to premature atherosclerosis [26]. Each of the components of the metabolic syndrome has been independently associated with vascular dysfunction. In addition to insulin resistance, release of proinflammatory cytokines (e.g., interleukin-6, tumor necrosis factor-α) by visceral adipose tissue or other as yet undefined factors may also contribute to vascular dysfunction or adverse clinical outcomes) in patients with the metabolic syndrome [27]. However, they do not together fully explain the 2.6-fold increased risk of coronary death among those with the metabolic syndrome, suggesting that other mechanisms may contribute to the association between the metabolic syndrome and the increased risk of CAD. One such mechanism may involve the potential adverse effect of features of the metabolic syndrome on vascular function and, in particular, endothelial function, thereby increasing the potential for atherothromobotic complications [28].

In our cases there was no significant difference regarding sex predominance and in comparison and in one study it was stated that gender remained significantly associated with IHD/ECG when forced into a model that included age and the three components of the metabolic syndrome identified by factor analysis. Thus, gender and the metabolic syndrome had independent associations with prevalent IHD, which means that sex differences in IHD were not explained by the metabolic syndrome [29].

In summary, principal component analysis shows an association between metabolic syndrome variables and prevalent IHD in older adult men and women. Serum insulin, body size, and dyslipidemia appear to represent a composite central metabolic factor, whereas glucose and blood pressure may each reflect other physiologic processes. The frequency of unrecognized IHD in older adults with the metabolic syndrome supports the potential for prevention efforts in persons with the metabolic syndrome or its components [30].

In our study there was an association between IHD, stroke and Mets and that was confirmed in one study in which it was established that hazard risks for CHD and stroke with the metabolic syndrome and its components, adjusted for age, gender, smoking, drinking and physical activity status were significant in both genders [31].

One study speaking about Mets in chines people [32] saying that compared with Western populations, the Chinese have lower serum cholesterol, lower prevalence of obesity, higher plasma glucose, and different profiles of cardiovascular disease (CVD) because of different genetic and environmental factors [20–23]. Several studies confirmed that the prevalence of metabolic syndrome varies in the Chinese based on the definition used [24–27]. But only

one study [25] compared the relationship of NCEP and IDF definitions with CVD in elderly Chinese people in Beijing. Unfortunately, WHO and CDS definitions, which have been proposed for screening high-risk Chinese individuals, were not considered. Most recently, a new JIS definition was proposed by IDF and AHA/NHLBI, but no population-based study has compared the relationship of the new JIS definition and previous definitions with CVD in the Chinese. Therefore, questions remain about which metabolic syndrome definitions are more strongly associated with the risk of CVD in the Chinese.

In 12(8%) of our patients there was an evidence of PAD and in comparison several studies in Western populations showed that metabolic syndrome was associated with PAD [9]. Furthermore, Conen's group reported that metabolic syndrome is associated with an increased risk of PAD and this risk was completely attenuated by CRP and soluble intercellular adhesion molecule-1. In China, He and coworkers reported that metabolic syndrome was significantly associated with PAD after adjustment for potential confounders, but gender difference and whether the association was related to CRP were not explored in that study. They found that all five definitions of metabolic syndrome were significantly related to PAD in men, but neither a full definition nor an individual component except for dysglycemia (FPG ≥5.6 mmol/L or known treatment for diabetes) and CDS obesity (BMI >25 kg/m2) was associated with PAD in women after adjustment for potential confounders. Further adjustment for CRP, the association of metabolic syndrome and PAD was not substantially decreased in men, although their previous studies proved that CRP was associated with metabolic syndrome and type 2 diabetes in that rural Chinese population. The significant gender difference in the association of metabolic syndrome and PAD may be due to dysglycemia, obesity, and lifestyle; they observed that women had a significantly greater prevalence of diabetes (7.6% versus 5.0%) and obesity (44.8% versus 36.3%) than men, and that men had a significantly higher rate of current smoking (58.6% versus 0.1%) and alcohol consumption (40.4% versus 0.7%) than women [9].

In our patients STG both fasting and non-fasting was commonly elevated and according to one study it was said that an elevated serum level of LDL cholesterol is a well-known risk factor for cardiovascular disease (CVD), but the role of elevated triglyceride levels is debated. Controversies regarding hypertriglyceridemia as an independent risk factor for CVD have occurred partly because elevated triglyceride levels are often a component of atherogenic dyslipidemia they are associated with decreased levels of HDL cholesterol and increased levels of small dense LDL particles, which are highly atherogenic. Findings from several large studies indicate that elevated levels of triglycerides (either fasting or no fasting) or, more specifically, triglyceride-rich lipoproteins and their remnants, are independently associated with increased risk of CVD. Possible mechanisms for this association include

excessive free fatty acid release, production of proinflammatory cytokines, coagulation factors, and impairment of fibrinolysis [10].

We noticed that mortality in our patients was more in patients having Mets and this was confirmed in a study done in Spain in which it was said that there is a significant association between IHD mortality and the prevalence of metabolic syndrome in workers from different Spanish regions [11].

Diabetes mellitus was commonly encountered in our patients with Mets and there is an interesting an account regarding DM and (IHD) saying that patients with Mets and T2DM submitted to angiography and IVUS, had more severe coronary lesions compared to Mets patients without diabetes. This finding suggests that beyond insulin resistance that is present in Mets, hyperglycemia may also play a role in the development of atherosclerotic disease. IVUS was useful for diagnosing 8% of severe cases initially considered to be moderate obstructions when using just CA in this scenario [12].

Another study confirmed an increased incidence of stroke saying that metabolic syndrome is associated with increased the risk of cardiovascular disease and stroke [13]. In a study from Korea the authors relate to metabolic syndrome with specific gender associations and with lower socioeconomic status and psychological factors [13]. While in our study we had not seen such an association.

Conclusions

Metabolic syndrome is commonly found in cases admitted into Samawah CCU (both with unstable angina and acute myocardial infarction). All elements of Mets (hypertension, diabetes mellitus, obesity, low HDL, high STG) are commonly found in our cases so we should deal with all these parameters in a meticulous way as a primary care and for secondary prevention so as to reduce the incidence of ischemic heart diseases and their complications

Acknowledgment

I would like to express my appreciation to Mis Nagham Naiem, a member of scientific committee in Al-Husaien teaching hospital / Sammawah who had done her best regarding arrangement and printing of this manuscript.

Ethical Approval

The study was approved by the Ethical Committee.

Conflicts of Interest

The author declare that he has no competing interests.

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