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Impact of metabolic syndrome on angiographic severity in Egyptian patients with acute coronary syndrome

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ABSTRACT

Background: Coronary artery disease (CAD) is a major health problem around the world. Acute coronary syndrome (ACS) is a serious and life threatening presentation of CAD. Metabolic syndrome (MetS) is a major risk factor for CAD.
Objectives: To study the impact of MetS on angiographic severity in Egyptian ACS patients.
Methods: The study included 100 patients admitted to coronary care unit of Zagazig University Hospital by ACS, among them 50 patients had Mets. All patients had undergone history taking and clinical examination, ECG, echocardiography, laboratory tests, and coronary angiography with measuring of Gensini score.
Results: Patients with metabolic syndrome were significantly younger ($p = 0.003$). Body mass index, waist circumference, systolic, and diastolic blood pressures, fasting blood glucose, hemoglobin A1c, and serum triglycerides were significantly higher, and HDL-cholesterol was significantly lower in metabolic syndrome patients ($p < 0.00001$ for each). Incidence of left main coronary artery disease and three-vessel disease were significantly higher in metabolic syndrome patients ($p = 0.027$, and 0.0211 respectively). Gensini score was significantly higher in metabolic syndrome patients ($p = 0.0007$). There was a significant positive correlation between Gensini score and waist circumference ($r = 0.345$, $p = 0.0004$), hemoglobin A1c ($r = 0.297$, $p = 0.0027$), and systolic blood pressure ($r = 0.253$, $p = 0.012$).
Conclusion: Acute coronary syndrome patients when associated with metabolic syndrome tend to have more extensive coronary artery disease.

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1. Introduction

Coronary artery disease (CAD) is a major worldwide heath problem,[1] and this problem is even more pronounced in developing countries.[2]

Among the different forms of CAD, acute coronary syndrome (ACS) represents one of the severest, most important, and life threatening presentation.[3]

Metabolic syndrome (MetS) represents a group of cardiovascular risk factors. This group includes elevated blood pressure (BP), hyperglycemia, central obesity, elevated triglyceride (TG) levels, and decreased high-density lipoprotein cholesterol (HDL-C).[4]

Metabolic syndrome represents a major health problem as all components of MetS are well defined risk factors for developing of cardiovascular diseases (CVD). Also, patients with MetS are at higher risk of morbidity and mortality from CVD.[4]

Previous researchers have found a relation between different components of MetS and the angiographic severity of CAD in the western countries,[5] in India,[6] in Korea[7] as well as in Turkey.[8] However, no data are available about this relation in Egypt, a country with different and variable lifestyle patterns, food habits, urbanization, and socioeconomic and cultural factors.

So, we aimed to study the impact of MetS on angiographic severity in Egyptian ACS patients.

2. Patients and methods

Our study was cross-sectional study; we included 100 ACS patients who were presented to the Coronary Care Unit of the Cardiology Department, Zagazig University during the period from June 2015 to June 2016.

The inclusion criteria met were first episode of ACS and age ≥18 years. The diagnosis of ACS was made in the presence of serial increase of cardiac biomarkers, associated with typical ECG changes and/or typical symptoms, as defined by the ACC/AHA guidelines.[9] Patients with ST-segment elevation or new, left bundle

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branch block on the admission ECG were diagnosed with ST-segment elevation myocardial infarction (STEMI).[9] Patients without STEMI were categorized as having non-ST-segment elevation ACS (NSTEACS).[10]

We excluded the patients with prior CAD or who underwent coronary revascularization. Also the patients with advanced liver or kidney disease, neoplasm, acute infections, or any contraindication for coronary angiography[9,10] were excluded from our study.

According to the presence of MetS, patients were classified into two groups:

Group I: Included fifty patients with Mets.
Group II: Included fifty patients without Mets.

MetS was diagnosed if the patient had three of the five items of MetS according to the harmonized definition of MetS provided by the World heart Federation and the International Association for the Study of Obesity[11] (Table 1).

Central obesity was defined according to the cutoff values of waist circumference and associated cardiovascular risk in Egyptians.[12] Therefore, we defined central obesity as waist circumference was ≥93.5 cm men and ≥92 cm for women.

An informed written consent was obtained from every patient, and we did the following for all patients:

1) Full history taking and thorough clinical examination with emphasis on:
   - Body weight and height.
   - Waist circumference: measured using an inelastic tape, taken after expiration at the level of mid-distance between the bottom of the rib cage and the top of the iliac crest.[12]
2) Complete standard 12-leads electrocardiography.
3) Laboratory testing: the following laboratory test were done to all patients:
   - Cardiac biomarkers: creatine kinase (CK), CK-MB, and Troponin I.
   - Fasting serum lipids: with measuring of cholesterol, triglycerides, low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C).
   - Fasting and 2 h postprandial blood glucose level and hemoglobin A1c level.
4) Coronary angiography: coronary angiography was done to all patients. The coronary artery system was visually estimated by an expert angiographer who was unaware of patients' clinical data. The coronary artery narrowing expressed as percentage of luminal diameter stenosis. Lesions with ≥70% narrowing in major epicardial artery or ≥50% narrowing in the left main coronary artery were considered significant angiographic stenosis.[13]

Gensini score was calculated for every patient to assess the angiographic severity. In this score, give points to every lesion according to the percentage of stenosis multiplied by the importance of the diseased artery. Accordingly, we give 1 for 25% stenosis, 2 for 50%, 4 for 75%, 8 for 90%, 16 for 99% and 32 for total occlusion. The score is then multiplied by a factor according to the site of the lesion.[14]

All data were analyzed using the SPSS for Windows (Version 20.0; Armonk, NY, USA: IBM Corp.) package program. Differences between patients' groups were analyzed using chi-square test and Student's *t*-test. Correlations between different variables were investigated by Pearson correlation analysis. A p value <0.05 was regarded as being statistically significant.

The study protocol had been approved by the Institutional Review Board of the Faculty of Medicine, Zagazig University.

3. Results

Regarding clinical and laboratory findings and as shown in Table 1, there was no significant difference between the two groups regarding sex, duration or heart rate. Patients with Mets were significantly younger in age ($p = 0.003$). Waist circumference, body mass index, systolic blood pressure, diastolic blood pressure, fasting blood glucose, hemoglobin A1c, and serum triglycerides level were significantly higher in patients with MetS ($p < 0.00001$ for each), while serum HDL-C level was significantly lower in patients with MetS ($p < 0.00001$).

Regarding findings of coronary angiography and as shown in Table 2, among patients with MetS, there were significantly more patients with left main coronary artery (LMCA) disease (14% versus 2%, $p = 0.027$), and more patients with three-vessel disease (22% versus 6%, $p = 0.0211$). Gensini score was significantly higher in patients with MetS (30.1 ± 13.11 versus 21.4 ± 9.21, $p = 0.0002$).

As shown in Fig. 1, there was a significant positive correlation between waist circumference and Gensini score ($r = 0.345$, $p = 0.0004$). As shown in Fig. 2, there was a significant positive correlation between hemoglobin A1c level and Gensini score ($r = 0.295$, $p = 0.0027$). As shown in Fig. 3, there was a significant positive correlation between systolic blood pressure and Gensini score ($r = 0.253$, $p = 0.012$).

Table 1
Clinical and laboratory data.

	MetS ($n = 50$)	No MetS ($n = 50$)	p
Age (years)	47.5 ± 8.72	52.9 ± 9.11	0.003
Sex			
Male	28 (56%)	35 (70%)	0.147
Female	22 (44%)	15 (30%)	
Clinical presentation:			
- STEMI	18 (36%)	22 (44%)	0.414
- NSTEACS	32 (64%)	28 (56%)	
Waist circumference (cm)	100.4 ± 12.51	85.8 ± 11.26	<0.00001
Body mass index (kg/m^2)	34.8 ± 6.32	23.8 ± 4.51	<0.00001
Heart rate (beat/min)	75.3 ± 11.54	72.1 ± 12.81	0.192
Systolic blood pressure (mmHg)	133.2 ± 18.33	116.1 ± 10.54	<0.00001
Diastolic blood pressure (mmHg)	87.3 ± 11.62	78.2 ± 7.23	<0.00001
Fasting blood glucose (mg/dl)	158 ± 24.1	87.1 ± 9.4	<0.00001
Hemoglobin A1c (%)	8.15 ± 1.91	5.23 ± 1.22	<0.00001
Triglycerides (mg/dl)	163 ± 25.4	118 ± 14.2	<0.00001
HDL-C (mg/dl)	41.2 ± 8.21	53.1 ± 7.5	<0.00001

Data are expressed as mean ± SD or number (%). HDL-C = high density lipoprotein cholesterol. STEMI = ST-segment elevation myocardial infarction. NSTEACS = non-ST-segment elevation acute coronary syndrome.

Table 2
Coronary angiography results.

	MetS ($n = 50$)	No MetS ($n = 50$)	p
Diseased vessel:			
- LMCA	7 (14%)	1 (2%)	0.027
- LAD	40 (80%)	33 (66%)	0.115
- LCX	33 (66%)	29 (58%)	0.41
- RCA	23 (46%)	20 (40%)	0.545
Number of diseased vessels:			
- Single vessel	14 (28%)	21 (42%)	0.142
- Two vessels	25 (50%)	26 (52%)	0.841
- Three vessels	11 (22%)	3 (6%)	0.0211
Gensini score	30.1 ± 13.11	21.4 ± 9.21	0.0002

Data are expressed as mean ± SD or number (%). LMCA = left main coronary artery, LAD = left anterior descending, LCX = left circumflex, RCA = right coronary artery.

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