IMPACT OF METABOLIC SYNDROME ON HOSPITAL OUTCOME IN PATIENTS WITH ACUTE CORONARY SYNDROME IN HAWLER TEACHING HOSPITAL

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Abstract
Background and Objectives
According to the world health organization data published on April 2011, coronary heart disease deaths reached 14.12% of the total deaths in Iraq. The objective of the study was to evaluate the effect of metabolic syndrome on in hospital complications, left ventricular systolic function and ischemic mitral regurgitation in patients with first acute coronary syndrome.

Patients and Methods
The study sample consisted of 95 patients (57 male, 38 female), their ages ranged between 35-90 years with the first acute coronary syndrome who had been admitted to the Coronary Care Unit of Hawler Teaching Hospital from October 2013 to April 2014. Patients were categorized into group A that represent those with metabolic syndrome and group B without metabolic syndrome.

Results
Hypertension, diabetes, fasting hyperglycemia and hypertriglyceridemia were higher among group A than group B. Cardiogenic shock, pulmonary edema, arrhythmias, mortality, early ischemic mitral regurgitation and early left ventricular systolic dysfunction were higher among group A vs. group B but without statistical significance.

Conclusions
Metabolic syndrome is an important predictor for in hospital complications, left ventricular systolic dysfunction and early ischemic mitral regurgitation in patients with acute coronary syndrome.

Key words
Metabolic syndrome, Acute coronary syndrome

Introduction
Metabolic syndrome (syndrome X, insulin resistance syndrome) consists of a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease (CVD) and diabetes mellitus (DM); the major feature of the metabolic syndrome (MS) include central obesity, hypertriglyceridemia, low HDL cholesterol, hyperglycemia, and hypertension1. It was estimated that around 20-25 % of the world’s adult population has metabolic syndrome and they are twice as likely to die from and three times as likely to have a heart attack or stroke compared with people without the syndrome. In addition, people with metabolic syndrome have a five fold greater risk of developing type 2 diabetes2. Shehab et al found a high prevalence of MS in acute coronary syndrome (ACS) patients in United Arab Emirate (UAE), which was associated with hypertension and diabetes mellitus. Hypertension, hyperglycemia and low high-density lipoprotein cholesterol (HDLc) were associated with higher in

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hospital mortality and heart failure\(^3\).

According to the latest World Health Organization data published on April 2011, coronary heart disease deaths reached 14.12\% of the total deaths in Iraq\(^4\), however there are no published studies done in Iraq to assess the impact of metabolic syndrome on in hospital outcome of patients with ACS.

We therefore set out to evaluate the effect of metabolic syndrome on in hospital clinical complications, left ventricular systolic function and ischemic mitral regurgitation in patients with first acute coronary syndrome.

**Patients and methods**

A prospective review of series of cases with ACS was carried out during the period from October 2013 to April 2014. The study included 95 patients, 57 males (60\%) and 38 females (40\%), with first attack of ACS, who had been admitted to the Coronary Care Unit (CCU) of Hawler Teaching Hospital (Erbil-Iraq) within the first 24 hours of pain were included in the study. The mean age (+SD) was 61.75±10.9 years, ranging from 35-90 years.

According to the new International Diabetic Federation (IDF)\(^5\); metabolic syndrome diagnosed when the patients presented with: Central obesity defined as waist circumference ≥ 94cm for men and ≥ 80cm for women; Plus any two of the following four factors: 1- Raised TG level: ≥ 150 mg/dL or specific treatment for this lipid abnormality. 2- Reduced HDL cholesterol < 40 mg/dL in males and < 50 mg/dL in females, or specific treatment for this lipid abnormality. 3- Raised blood pressure: systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg, or treatment of previously diagnosed hypertension. 4- Raised fasting plasma glucose (FPG) ≥ 100 mg/dL or previously diagnosed type 2 diabetes.

**Statistical analysis**

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 19). Chi square test of association was used to compare between proportions of the two study groups. When the expected count of more than 20\% of the cells of the table was less than 5, Fisher’s exact test was used. Student’s t test was used to compare between means of the two study groups. P value of ≤ 0.05 was considered statistically significant\(^13\).

**Results**

The prevalence of metabolic syndrome (group A) in our patients with first acute coronary syndrome was 60 (63\%), (figure 1).

Our patients with first acute coronary syndrome was 60 (63\%), (figure 1).
Table 1: Baseline characteristics in patients with and without metabolic syndrome

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A</th>
<th>Group B</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=60</td>
<td>n=35</td>
<td></td>
</tr>
<tr>
<td>Age, mean ± SD, years</td>
<td>61.3±10.3</td>
<td>62.4±11.8</td>
<td>0.622</td>
</tr>
<tr>
<td>(Male (n=57)</td>
<td>(% 50) 30</td>
<td>(% 77) 27</td>
<td></td>
</tr>
<tr>
<td>(Female (n=38)</td>
<td>(% 50) 30</td>
<td>(% 23) 8</td>
<td></td>
</tr>
</tbody>
</table>
| Hypertension               | (% 82) 49| (% 40) 14| *0.001>
| Diabetes Mellitus          | (% 63) 38| (% 11) 4 | *0.001>
| Smoker                     | (% 23) 14| (% 34) 12| 0.376|
| Diagnosis                  |          |          | 0.225|
| STEMI                      | (% 71) 43| (% 77) 27|     |
| NSTEMI                     | (% 13) 8 | (% 3) 1 |     |
| UA                         | (% 15) 9 | (% 20) 7 |     |
| Thrombolytic therapy       | (% 27) 16| (% 43) 15| 0.104|

Metabolic syndrome (group A) was associated with higher admission mean RBS, FBS, TG, vs. group B (P<0.001), while there was no significant difference between the two groups in relation to the HDL, blood urea and Creatinine (table 2).

Table 2: Laboratory findings according to the presence of metabolic syndrome

<table>
<thead>
<tr>
<th>Variables (Mean (mg/dl)±SD)</th>
<th>Group A (n=60)</th>
<th>Group B (n=35)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission RBS</td>
<td>103±245</td>
<td>56±154</td>
<td>*0.001 &gt;</td>
</tr>
<tr>
<td>FBS</td>
<td>112±46</td>
<td>36±99</td>
<td>*0.001</td>
</tr>
<tr>
<td>TG</td>
<td>103±178</td>
<td>45±111</td>
<td>*0.001 &gt;</td>
</tr>
<tr>
<td>HDL</td>
<td>10±39</td>
<td>9±40</td>
<td>0.814</td>
</tr>
<tr>
<td>Mean blood urea</td>
<td>54±31</td>
<td>49±19</td>
<td>0.402</td>
</tr>
<tr>
<td>S. creatinine</td>
<td>1.2±1</td>
<td>1.1±0.4</td>
<td>0.441</td>
</tr>
</tbody>
</table>

Group A =patients with metabolic syndrome  *statistically significant, FBS=fasting blood sugar, TG=triglyceride Group B=patients without metabolic syndrome s=serum, HDL=High density lipoprotein Pulmonary edema, arrhythmias and cardiogenic shock were more frequently reported among group A patients vs. group B patients without statistical significance. One death reported among group A patients vs. non in-group B patients without statistical significance (table 3).
Table 3: Impact of MS on early clinical outcome

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A n=60</th>
<th>Group B n=35</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary edema</td>
<td>(46.7%) 28</td>
<td>(25.7%) 9</td>
<td>*0.232</td>
</tr>
<tr>
<td>VT, VF</td>
<td>(5%) 3</td>
<td>(5.7%) 2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>(13.4%) 8</td>
<td>(2.9%) 1</td>
<td>*0.615</td>
</tr>
<tr>
<td>Total</td>
<td>(18.3%) 11</td>
<td>(% 8.6) 3</td>
<td></td>
</tr>
<tr>
<td>Cardiogenic shock</td>
<td>(8.3%) 5</td>
<td>(2.8%) 1</td>
<td>**0.232</td>
</tr>
<tr>
<td>Mortality</td>
<td>(1.7%) 1</td>
<td>0</td>
<td>**1.000</td>
</tr>
</tbody>
</table>

Group A = patients with metabolic syndrome, Group B = patients without metabolic syndrome
VT = Ventricular tachycardia, VF = Ventricular fibrillation, * By Fisher’s Exact Test, ** By chi square
Metabolic syndrome (group A) was associated with higher frequency rate of early ischemic MR 21 (35%) vs. group B 6 (17%), but without statistical difference (table 4). Higher frequency rate of left ventricular systolic dysfunction among group A has been reported 27 (45%), vs. group B 11 (31%), without statistical significance (table 4).

Table 4: Impact of metabolic syndrome on ischemic mitral regurgitation and left ventricular systolic function diagnosed by transthoracic echocardiography.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A n=60</th>
<th>Group B n=35</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic MR</td>
<td>(35%) 21</td>
<td>(17%) 6</td>
<td>0.062</td>
</tr>
<tr>
<td>LV systolic dysfunction</td>
<td>(45%) 27</td>
<td>(31%) 11</td>
<td>0.426</td>
</tr>
</tbody>
</table>

MR = Mitral regurgitation
Group A = patients with metabolic syndrome
Group B = patients without metabolic syndrome

Discussion
In our study, the prevalence of MS among patients with ACS was 60 (63%), this is in agreement with a recent study done in 6 Middle Eastern countries including the Gulf and the UAE and reflects both the high risk of ACS among MS patients and the high prevalence of MS in these populations due to sedentary lifestyle, lower health awareness and higher income. The frequency of female patients among group A was higher than group B but without statistical significance, this can be explained by the higher rate of obesity and diabetes, and sedentary lifestyle seen in women, this is similar to study done in Spain, in addition this gender deference may be due to hormonal deference between male and female, male had lower plasma leptin levels comparing to female, this hormone regulate the total amount of fat stored in the adipose tissues also energy imbalance, while our study disagree with study done in the UAE which showed male more frequently
had MS than female in patients with ACS. The mean age for group A and for group B were 61.3 ±10.3 years and 62.4 ±11.8 years respectively without statistical significance, this is comparable with a study done in Eastern Finland.

This study showed that group A patients were more likely to be hypertensive and diabetic 49 (82 %), 38 (63 %) respectively (p <0.001), this may be explained by that in this study we depend on the IDF criteria for the diagnosis of MS of which hypertension and diabetes are among the diagnostic criteria. Also group A patients had high admission RBS, FBS and TG vs. group B (P<0.001), our result were similar to zeller et al, which showed MS patients more likely to be hypertensive, diabetic, higher admission FBS and RBS. It seems that the higher prevalence of hypertriglyceridemia and hyperglycemia may be related to genetic and high intake of carbohydrate (especially through bread and dates consumption) and fat (especially through saturated fat and margarines, fried food and butter).

Recently there has been growing interest in the components of MS, not only in relation to the number present, but also their different combinations, in the prediction of cardiovascular risk. In this study, hypertriglyceridemia and hyperglycemia and hypertension were the most prevalent components of MS, this was also the most frequent combination observed in patients with ischemic heart disease as shown that combination of DM and hypertension sharply increases cardiovascular risk.

There was no statistically significant difference of HDLc level between both groups; this is may be due to falsely low HDLc concentrations in the presence of acute-phase reactants after an ACS.

This study showed that highest frequency of in-hospital complications among group A patients were pulmonary edema and cardiogenic shock (46.7 %, and 8.3 % respectively), Pulmonary edema and cardiogenic shock risk may not be associated with the metabolic syndrome per se, but rather with individual risk factors reflected by metabolic syndrome may play role, which is similar to study done in Korea.

Mortality reported in 1 (1.7%) of group A patients, while non among group B, without statistical significance, this is in disagreement to zellar et al, which showed that patients with STEMI who fulfill the criteria for MS, the mortality is significantly higher (P=0.01), this is may be due to small number of patients and short duration of the study.

Arrhythmias occurred to 11(18.3 %) of group A patients (VT and VF=5%, others=13.4%) and this is higher than group B patients 3(8.6 %), (VT and VF=5.7%, others=2.9%) without statistical significance, this is similar to zellar et al, which showed metabolic syndrome didn’t appear to have an impact on the risk of ventricular tachyarrhythmia.

Left ventricular systolic dysfunction account for 45 % of group A vs. group B 31%, without statistical significance, this is in consistence with study done in turkey which showed that patients who fulfill the criteria for MS with first attack of STEMI their LV systolic function more severely impaired without statistical significance.

Higher frequency rate of Ischemic mitral regurgitation were recorded among group A 21 (35 %) vs. group B 6 (17 %), but without statistical significance, until now no study have been done to assess the impact of MS on early ischemic mitral regurgitation in patients with ACS, although it’s shown that MS may alter left ventricular geometry and which may be implicated to the occurrence of ischemic mitral regurgitation.

Conclusions

High frequency rate of acute pulmonary edema, serious arrhythmias, early left ventricular systolic dysfunction and ischemic mitral regurgitation has been observed in patients with metabolic syndrome vs. non metabolic syndrome in the early phase of acute coronary syndrome but without statistical significance.

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