Prevalence of the Metabolic Syndrome in Renal Transplant Recipients

Ibrahim M. Elkehili¹*, Ahmed B. Kekli¹, Ali M. Grera²

1. Nephrology Department, National Heart Center, Tripoli, Libya
2. Community Department, Faculty of Medicine, Tripoli University, Tripoli, Libya

Abstract

Introduction: The cause of the metabolic syndrome (MS) is incompletely understood but represents a complex interaction between genetic, environmental, and metabolic factors, clearly including diet, and level of physical activity. The prevalence of MS is continuously increasing in the general population. Recently it has been found that MS is also common in renal transplant recipients (RTRs). The aim of this study was to determine the prevalence and characteristics of MS in a group of Libyan renal transplant recipients, using two different diagnostic criteria.

Methods: This study was conducted at the Nephrology Department of the National Heart Center, Tripoli, Libya. We determined the prevalence of MS in a group of renal transplant recipients using both the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) criteria and the International Diabetes Federation (IDF) criteria. All patients were more than six months post transplantation. Patients with Pre-transplant diabetes mellitus were excluded from the analysis.

Results: By using the NCEP-ATP III criteria 26 out of 91 patients (28.6%) had the metabolic syndrome. MS was commoner in females than males, affecting 12 out of 35 females (34.3%) and 14 out of 56 males (25%). Using the IDF criteria the metabolic syndrome was diagnosed in 23 patients (25.3%). In this group of patients the most common component of the metabolic syndrome was high blood pressure and the least common was impaired glucose tolerance and diabetes.

Conclusions: The prevalence of MS in our renal transplant patients is high, affecting females more than males.

Key words: International Diabetes Federation; Metabolic Syndrome; NCEP-ATP III; Renal Transplant Recipients

The authors declared no conflict of interest

Introduction

The Metabolic syndrome (MS) was originally described in 1988 as «syndrome X» by Reaven et al [1]. The Adult Treatment Panel III (ATP III) of the National Cholesterol Education Program (NCEP) [2] defines MS clinically by the presence of any three of the following five traits: abdominal obesity, elevated fasting glucose level (reflecting insulin resistance), elevated blood pressure (BP), elevated serum triglyceride level and low HDL cholesterol level. The International Diabetes Federation (IDF) criteria define MS by the presence of central obesity plus any two of the remaining criteria used in the ATPIII/NECP classification.

The cause of the metabolic syndrome is not completely understood but it represents a complex interaction between genetic, environmental, and metabolic factors, clearly including diet [3, 4] and level of physical activity [4, 5]. The prevalence of MS is continuously increasing in the general population [6]. Recently, it has been found that MS is also common in renal transplant recipients (RTRs) [7]. The Metabolic syndrome is associated with a two-fold increase in the risk for cardiovascular disease (CVD), CVD mortality, myocardial infarction, and stroke as well as a 1.5 fold increase in the risk of all-cause mortality [8, 9]. Renal transplant recipients (RTRs) have about four-times higher mortality after the first year compared with the general population [10]. CVD events represent the single most frequent cause of death in RTRs accounting for 35-50% of all-cause mortality and

* Corresponding author; P.O. Box No. 80112, Tripoli, Libya; E mail: elkhili57im@hotmail.com
they occur at least twice as often as in the background population [10-14].

A community based population study demonstrated that established CVD risk factors are associated with the development of new onset kidney disease [15]. Recently, both obesity and MS have been suggested to participate in the pathogenesis of renal disease [16] as well as chronic allograft nephropathy [7]. Another study showed that MS is a prominent risk factor for new-onset diabetes mellitus, chronic graft dysfunction, graft loss and patient death in RTRs [17]. These reports suggest that MS may be a risk factor for renal dysfunction and CVD not only in the general population but also in RTRs. The present study investigated the prevalence of MS in a group of Libyan renal transplant recipients using the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATPIII) and the International Diabetic Federation (IDF) criteria.

### Methods

This study was conducted at the Nephrology Department of the National Heart Center, Tripoli, Libya. We included a total of 91 live related and non-related renal transplant recipients, all of whom were more than 6 months post transplantation. Patients with pre-transplant diabetes mellitus were excluded. Patients were receiving combination therapy with cyclosporine or tacrolimus, azathioprine or mycophenolate mofetil along with prednisolone at a dose of 0.07 to 0.1mg/kg/day. All patients gave informed consent for participation in the study.

After 10-12 hours over night fast, blood samples were taken for determination of glucose, creatinine, triglyceride (TG), and high density lipoprotein (HDL) cholesterol by auto-analyzer (Cobas Integra 400 plus, Roche). Waist circumference was determined by using a non-stretchable measuring tape midway between the iliac crest and costal margin.

According to NCEP ATP III criteria, the diagnosis of MS was made when three or more of the following criteria were fulfilled [18]: (i) serum TG level ≥ 150 mg/dl or specific treatment for this lipid abnormality, (ii) serum HDL cholesterol level < 40 mg/dl in men or < 50 mg/dl in women or specific treatment for this lipid abnormality, (iii) systolic blood pressure (SBP) ≥ 130 mmHg and/or diastolic blood pressure (DBP) ≥ 85 mmHg or use of antihypertensive medications, (iv) fasting plasma glucose level >100 mg/dl or use of anti-diabetic medications, and (v) waist girth > 102 cm for men and > 88 cm for women. According to the International Diabetes Federation criteria [19], subjects with central obesity (defined as waist girth > 102 cm for men and > 88 cm for women) plus any two of the remaining four criteria were considered to have MS.

The statistical Package for Social Sciences version 14 for windows (SPSS Inc, Chicago, IL, US) was used for statistical analysis. Continuous data were expressed as means and standard deviations and categorical data as percentages. Continuous variables were compared by the independent t-test and categorical data by the Chi squared test. P value < 0.05 was considered statistically significant.

### Results

By using the NCEP-ATPIII criteria 26 of 91 patients (28.6%) had the metabolic syndrome. It was diagnosed in 12 out of 35 females (34.3%) and 14 out of 56 males (25%) indicating female predominance. The mean age of the MS group was more than that of the non-MS group (46 ± 12 versus 40 ± 11 years respectively; P = 0.03). Mean serum creatinine level was not different between the two

<table>
<thead>
<tr>
<th>Prevalence of different components of the metabolic syndrome in the study population</th>
<th>Total (n = 91)</th>
<th>Men (n = 56)</th>
<th>Women (n = 35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central obesity</td>
<td>46</td>
<td>36</td>
<td>63</td>
</tr>
<tr>
<td>Hypertension</td>
<td>58</td>
<td>60</td>
<td>54</td>
</tr>
<tr>
<td>High TG</td>
<td>44</td>
<td>48</td>
<td>37</td>
</tr>
<tr>
<td>Low HDL-Cholesterol</td>
<td>33</td>
<td>25</td>
<td>46</td>
</tr>
<tr>
<td>Hyperglycemia</td>
<td>29</td>
<td>34</td>
<td>23</td>
</tr>
<tr>
<td>MS (NCEP-ATP III criteria)</td>
<td>28.6</td>
<td>25</td>
<td>34.2</td>
</tr>
<tr>
<td>MS (IDF criteria)</td>
<td>25.3</td>
<td>30.4</td>
<td>21.4</td>
</tr>
</tbody>
</table>

TG: triglyceride; HDL: high density lipoprotein; MS: metabolic syndrome; NCEP-ATP: National Cholesterol Education Program Adult Treatment Panel III; IDF: International Diabetes Federation
groups (1.2 ± 0.5 versus 1.4 ± 0.8 mg/dl respectively; P = 0.04).

By using IDF criteria, MS was diagnosed in 23 patients (25.3%), the prevalence was 31.4% in the females and 21.4% in the males. Table-1 shows the prevalence of different components of the metabolic syndrome. The most prevalent component of the metabolic syndrome was elevated blood pressure and the least common was elevated fasting plasma glucose level.

Discussion

Among the numerous current definitions of the MS (World Health Organization, European Group for the Study of Insulin Resistance, American Association of Clinical Endocrinologists, and the IDF), the one proposed by the NCEP-ATP III is most widely used [2]. The criteria were modified in 2005 by the American Heart Association (AHA) and the National Heart, Lung and Blood Institute (NHLBI) [20].

In the general population the prevalence of MS differs widely among ethnic groups and according to diagnostic criteria used [21-23]. De Varies et al showed that the prevalence of MS among renal transplant patients using the original NCEP ATP III criteria was 63% [7]. The Australian study on renal transplant patients using the same criteria revealed 50% prevalence of MS among these patients [24]. Porrini et al found that 37.7% of Spanish RTRs had MS by using the modified criteria [17]. These reports suggested that MS is more prevalent in renal transplant recipients as compared to the general population with ethnic variation.

Obesity is common in renal transplant recipients and is associated with worsening cardiovascular parameters and proteinuria progression [24]. The metabolic syndrome is a prominent risk factor for new-onset diabetes mellitus [17]. It has been reported that MS is a risk factor for renal dysfunction in the general population [15] and a prominent risk factor for chronic graft dysfunction [7, 17, 25, 26]. Our study did not show significant difference in serum creatinine levels between MS and non-MS patients.

Our results showed that the prevalence of MS differed according to the criteria used; it is slightly lower by using the IDF than the NCEP ATP III criteria (25.3% versus 28.6%). By using the NCEP ATP III criteria the prevalence of MS in our patients is consistent with the results of Ozdemir et al [25]. Some studies reported higher prevalence [7, 27, 28] while other investigators showed less prevalence [26, 29, 30] compared to our results. This may be due to ethnic variations. In this study was more prevalent in females compared to males, which is consistent with the results shown by the Chinese study [31] and by Elahi et al [27]. In contrast, the results of the Japanese study [30] showed that the prevalence of MS was more common in males than females. The most common component of metabolic syndrome was high blood pressure which is similar to the results of the Chinese study [31] and Elahi et al [27]. The least common component was impaired fasting glucose and diabetes mellitus which is consistent with the results shown by Elahi et al [27]. On other hand, the Chinese study results [31] showed that low high density lipoprotein-cholesterol level was the least common component.

Conclusion

The prevalence of MS in our renal transplant patients is high, affecting females more than males.

References

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