The metabolic syndrome (MetS) is a cluster of risk factors for atherosclerotic cardiovascular (CV) and renal disease that are linked to overweight, obesity, and a lack of physical activity,
The authors found an age-dependent increase in prevalence of early kidney disease (EKD), with an overall 8.9% prevalence of early CKD among the 1498 subjects. This rate is higher than estimates in previous studies performed in Spain (around 2.2% according to the Spanish study Epidemiología de la Insuficiencia Renal Crónica en España) or in the United States. This finding has no clear explanation other than sampling error. Nevertheless, the prevalence of EKD increased progressively with the number of traits of MetS, from 2.9% of the subjects with no MetS traits to 20% in subjects diagnosed with MetS, and reached 26.3% specifically in elderly subjects with MetS. Both MetS and EKD were associated

Table 1
Criteria for Diagnosis of Metabolic Syndrome According to the US National Cholesterol Education Program Adult Treatment Panel III

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Defining level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal obesity</td>
<td>Waist circumference: men, &gt;102 cm (&gt;40 in); women, &gt;88 cm (&gt;35 in)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>&gt;150 mg/dL (1.69 mmol/L)</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>Men &lt; 40 mg/dl (1.04 mmol/L); women &lt; 50 mg/dl (1.29 mmol/L)</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>&gt;130/85 mmHg</td>
</tr>
<tr>
<td>Fasting glucose</td>
<td>&gt;110 mg/dL (6.1 mmol/L).</td>
</tr>
</tbody>
</table>

HDL, high-density lipoprotein.
Diagnosis of the metabolic syndrome requires the presence of at least 3 of the listed criteria.
Source: Ford et al.2

Figure 1. Estimated prevalence of cardiovascular risk factors as assessed by the National Health and Nutrition Examination Surveys I, II, and III and incidence of end stage renal disease as reported by the United States Renal Data Systems Surveys. A rise in the incidence of end-stage renal disease paralleled the increasing prevalence of obesity. ESRD, end-stage renal disease. From Hall et al,4 with permission.

Figure 2. Prevalence of chronic kidney disease (top) and microalbuminuria (bottom) by number of the metabolic syndrome components. From Chen et al,10 with permission.

The authors found an age-dependent increase in prevalence of early kidney disease (EKD), with an overall 8.9% prevalence of early CKD among the 1498 subjects. This rate is higher than estimates in previous studies performed in Spain (around 2.2% according to the Spanish study Epidemiología de la Insuficiencia Renal Crónica en España) or in the United States. This finding has no clear explanation other than sampling error. Nevertheless, the prevalence of EKD increased progressively with the number of traits of MetS, from 2.9% of the subjects with no MetS traits to 20% in subjects diagnosed with MetS, and reached 26.3% specifically in elderly subjects with MetS. Both MetS and EKD were associated

Table 2
Current National Kidney Foundation Kidney Disease Outcomes Quality Initiative Staging System Risk for Chronic Kidney Disease

<table>
<thead>
<tr>
<th>Stage</th>
<th>eGFR (mL/min/1.73 m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≥90</td>
</tr>
<tr>
<td>2</td>
<td>≥60 &lt; 90</td>
</tr>
<tr>
<td>3</td>
<td>≥30 &lt; 60</td>
</tr>
<tr>
<td>4</td>
<td>≥15 &lt; 30</td>
</tr>
<tr>
<td>5</td>
<td>&lt;15</td>
</tr>
</tbody>
</table>

eGFR: estimated glomerular filtration rate (mL/min per body surface area). The decreases in eGFR in the different stages of chronic kidney disease need to be accompanied by the presence of proteinuria and/or other evidence of kidney damage.
Source: National Kidney Foundation.12
with an increase in carotid IMT, probably because atherosclerosis, MetS, and CKD can be driven by similar cardiovascular risk factors like hypertension, insulin resistance, obesity, dyslipidemia, and inflammation. The prevalence of EKD was higher in subjects with MetS in all age groups, as previously suggested by analysis of data obtained from 7832 participants in the third National Health and Nutrition Examination Survey (NHANES III). 10

Each trait of MetS was associated with a high OR of EKD, interestingly with the exception of low high-density lipoprotein (HDL). While low HDL is an important component of the abnormal lipid profile found in CKD patients, the early stage of EKD may theoretically be associated with more subtle functional changes in HDL, such as its capacity to accept cholesterol from macrophages, or cholesterol efflux capacity.16 Importantly, while obesity is a recognized risk factor for CKD, this study shows that it doubles the risk of an earlier stage of kidney disease. The authors concluded that MetS is an important risk marker for EKD and that their coexistence in patients significantly increases the risk of atherosclerosis as determined by carotid IMT. The current study indeed underscores the importance of the crosstalk between the kidney, the cardiovascular system, and mechanisms of early atherosclerosis.

As the authors indicated,15 the study was associated with several limitations. The definition of EKD was based on a single measurement of albumin/creatinine ratio, which may vary and might be influenced by other factors. In addition, while the carotid IMT is an accepted marker of structural changes related to early atherosclerosis, it might not reflect the early functional alterations consequent to the disease. Moreover, the observed changes in albumin/creatinine ratio may in fact reflect early dysfunction rather than structural changes in the kidney, and might thus better correlate to the early functional changes of atherosclerosis observed in patients with MetS and obesity, such as the degree of endothelial function.

The current paper may also support the notion that the early changes in kidney function associated with MetS do not only result from MetS but might also contribute to its mechanism, similar to the role that insulin resistance plays in the pathogenesis of this syndrome. This observation may have important clinical implications because they suggest that development of laboratory findings consistent with EKD in patients with MetS may reflect the systemic nature of MetS and serve as a marker for the progression of the syndrome. Future studies should be directed to elucidate the potential role of using this marker for prognosis and assessment of successful therapy, and to develop preventive and interventional tactics to decrease the prevalence and association of both EKD and MetS.

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CONFLICTS OF INTEREST

None declared.

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