Prevalence of Metabolic Syndrome in Chronic Kidney Disease: A Hospital Based Cross-sectional Study

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ABSTRACT

Background: The components of metabolic syndrome (MetS) are the established risk factors of chronic kidney disease (CKD). Therefore, MetS and interplay of its various components, have deleterious effects on patients with chronic kidney disease. The aims of our study was to find out the prevalence of MetS in chronic kidney disease patients and to find out the association of each component of MetS with chronic kidney disease.

Methods: A Hospital based cross-sectional study was carried out from February 2008 to August 2009. One hundred and sixty confirmed chronic kidney disease diagnosed patients were included in this study. Chronic kidney disease was defined from national kidney foundation guidelines. Anthropometric measurements of subjects were noted in a semi-structured pro-forma. Fasting blood sample was collected for the estimation of fasting blood glucose, triglyceride and HDL-cholesterol. Chronic kidney disease patients were diagnosed as having the metabolic syndrome by using the modified National Cholesterol Education Program Adult Treatment Program III criteria. Data were assessed by the t-test and Chi Square Test.

Results: Sixty (37.5%) of the chronic kidney disease patients had MetS according to modified National Cholesterol Education Program Adult Treatment Program III criteria. The prevalence of hypertension, high fasting blood glucose, high triglyceride, low HDL cholesterol and high waist circumference in chronic kidney disease patients was 112 (70.0%), 36 (22.5%), 74 (46.25%), 98 (61.25%) and 30 (18.75%) respectively. Among the five components of the metabolic syndrome, waist circumference has the highest positive predictive value (73.34%) for chronic kidney disease.

Conclusions: MetS occurs in more than one-third of chronic kidney disease patients. The prevalence of individual components of MetS is higher in chronic kidney disease patients.

Keywords: chronic kidney disease, dyslipidemia, hypertension, metabolic syndrome.

INTRODUCTION

Over caloric nutrition and sedentary lifestyle, the root causes of metabolic syndrome (MetS), are now common even in the developing countries. There are several studies, which have linked MetS with Chronic Kidney Disease (CKD).1-4 Besides traditional risk factors like hypertension and hyperglycemia, waist circumference (WC) has also been significantly correlated with reduced estimated glomerular filtration rate (eGFR) and microalbuminuria.1 The components of MetS are the established risk factors of CKD. Therefore, MetS...
and interplay of various components of MetS may have deleterious effects on patients with CKD. Most of these studies were conducted in the general population. To the best of our knowledge, this is the first study to find out the prevalence of MetS in CKD patients and to find out the association of each component of MetS with CKD in South East Asia. Our study aims to find out the prevalence of MetS in CKD patients and to study the association of each component of MetS with CKD.

METHODS

This hospital based cross-sectional study was conducted between February 2008 to August 2009, at Department of Clinical Biochemistry in collaboration with Department of Internal Medicine (nephrology unit), Tribhuvan University Teaching Hospital, Institute of Medicine, Nepal. Ethical approval was taken as per the requirements of Institutional Review Board. One hundred and sixty CKD diagnosed patients were included in the study. CKD was defined as either an eGFR of <60 mL/min per 1.73m² body surface area or urinary albumin-creatinine ratio of greater than 30 mg/gram. Anthropometric measurements like height, weight, WC of subjects were noted in a semi-structured pro-forma. WC was measured at the highest point of the iliac crest during minimal respiration. Two readings of blood pressure (BP) were measured using a mercury sphygmomanometer in the seated position after a 10 min rest period and mean was used for analysis. Fasting blood sample was collected for the estimation of glucose (FBG), triglyceride (TG) and HDL-cholesterol (HDL-C). All the biochemical parameters were assayed on BT 2000 Plus Biotechnica Instruments - clinical chemistry analyser. CKD patients were diagnosed as having the metabolic syndrome by using the modified National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria. According to the NCEP report, participants who had three or more of the following criteria were defined as having the MetS 1) abdominal obesity WC >102 cm in men and >88 cm in women, 2) TG ≥1.7 mmol/l, 3) HDL-C <1.03 mmol/l in men and <1.29 mmol/l in women, 4) systolic blood pressure ≥130 mmHg or a diastolic blood pressure ≥85 mmHg, and 5) FBG≥5.6 mmol/l. The participants who currently reported using anti-hypertensive or anti-diabetic medication were counted as having high blood pressure or diabetes, respectively.

The data was analyzed using Excel 2003, R 2.8.0 and Statistical Package for the Social Sciences (SPSS) for Windows Version 11.5 (SPSS Inc; Chicago, IL, USA). Difference for continuous variables was assessed by using the t-test, whereas association between categorical variables was assessed by using the Chi Square Test. A p-value of <0.05 was used to establish two tailed level of statistical significance at 95% confidence intervals.

RESULTS

One hundred and sixty patients with a confirmed diagnosis of CKD as per national kidney foundation guidelines were enrolled with their consent. Among these patients, 60 (37.5%) had the MetS according to modified NCEP ATP III criteria. The prevalence of the individual components of MetS in CKD patients is given in (Table 1).

Table 1. Prevalence of various components of MetS in CKD patients.

<table>
<thead>
<tr>
<th>Component of MetS</th>
<th>Number of Patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>112</td>
<td>70</td>
</tr>
<tr>
<td>High FBG</td>
<td>36</td>
<td>22.5</td>
</tr>
<tr>
<td>High TG</td>
<td>74</td>
<td>46.25</td>
</tr>
<tr>
<td>Low HDL-C</td>
<td>98</td>
<td>61.25</td>
</tr>
<tr>
<td>High WC</td>
<td>30</td>
<td>18.75</td>
</tr>
</tbody>
</table>

All the five components of MetS were significantly more prevalent in MetS group than in non-MetS group among CKD patients. While comparing the prevalence of individual components of metabolic syndrome between patients with metabolic syndrome and patients without metabolic syndrome, higher percentage of individual component was reported in patients with metabolic syndrome. However, there were no significant differences among gender and mean age in the prevalence of MetS in CKD patients.

Table 2. Comparison of subjects with and without MetS.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patient with MetS (n=60)</th>
<th>Patient without MetS (n=100)</th>
<th>Positive Predictive Value (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age(year)</td>
<td>46.97±11.77</td>
<td>45.7±9.58</td>
<td>NS</td>
<td>0.294</td>
</tr>
<tr>
<td>Sex</td>
<td>Male 26</td>
<td>54</td>
<td>NS</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Female 34</td>
<td>46</td>
<td></td>
<td>0.002</td>
</tr>
<tr>
<td>High systolic BP</td>
<td>48</td>
<td>50</td>
<td>73.3%</td>
<td>0.000</td>
</tr>
<tr>
<td>High diastolic BP</td>
<td>58</td>
<td>50</td>
<td>73.3%</td>
<td>0.000</td>
</tr>
<tr>
<td>High FBG</td>
<td>26</td>
<td>10</td>
<td>72.23%</td>
<td>0.001</td>
</tr>
<tr>
<td>High TG</td>
<td>52</td>
<td>22</td>
<td>70.27%</td>
<td>0.000</td>
</tr>
<tr>
<td>Low HDL-C</td>
<td>54</td>
<td>44</td>
<td>55.1%</td>
<td>0.000</td>
</tr>
<tr>
<td>High WC</td>
<td>22</td>
<td>8</td>
<td>73.34%</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Statistically significant at P-value <0.05. NS-Statistically non-significant

Among the five components of the metabolic syndrome, WC has the highest positive predictive (PPV) value (73.34%) for CKD (True Positive (TP)=22, False Positive(FP)=8), and was followed by FBG level (72.23%...
(TP=26, FP=10), TG level (70.27%) (TP=52, FP=22), decreased HDL-C level (55.1%) (TP=52, FP=22), and systolic BP (52.17%) (TP=48, FP=44), diastolic BP (73.3%) (TP=22, FP=8) (Table 2).

CONCLUSIONS

Our results indicate that MetS, as defined by the modified NCEP criteria, occurs in more than one-third of CKD patients. Moreover, WC was found to have the highest PPV. So, more emphasis needs to be given regarding the control of blood lipids level and central obesity in CKD patients. Further studies are needed to determine if identification and treatment of the MetS and its component might be beneficial in improving the outcome of CKD patients.

REFERENCES:


