Prevalence of metabolic syndrome (MetS) among male Kuwaiti adolescents aged 10 - 19 years*

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ABSTRACT

Background: The prevalence of overweight and obesity are high in Kuwait. Metabolic Syndrome is associated with both. It is expected to find the syndrome higher than that in other countries. Objective: To assess the prevalence of MS using two different diagnostic criteria, the International Diabetes Federation (IDF) and the National Cholesterol Education Program—Third Adult Treatment Panel Modified for age (NCEP-ATP III). Study design: A multi-stage random sample study. Methods: The analysis of data for this study was based on a sample of 303 male Kuwaiti adolescents, 10 - 19 years of age selected from intermediate and high schools. Anthropometric measurements and biochemical tests on blood samples were carried out. The IDF criterion requires waist circumference (WC) plus two of the following criteria: triglycerides (TG), high density lipoprotein (HDL), fasting blood sugar (FBS) and blood pressure (PB). The ATP III criterion requires three of the above parameters. The parameters mentioned must show increase in their values except for HDL which must show decrease in either criterion used. Results: Each of the two criteria revealed that the prevalence of MS was 14.8% and 19.5%, using the IDF and the ATP III criteria, respectively. HDL decreased in each of the two diagnostic criteria and the other four parameters increased, satisfying the diagnostic requirements of either criterion. Conclusions: Significant implications may be drawn from these results, especially when it comes to being at risk of type 2 diabetes (T2D) and cardiovascular disease (CVD).

1. INTRODUCTION

Since overweight (BMI ≥ 25 Kg/m²) and obesity (BMI ≥ 30 Kg/m²) are high in Kuwait [1,2] and since both are associated with metabolic syndrome (MS), it may be concluded that the prevalence of MS is also high [3]. In recent years, the prevalence of obesity in developing countries has tripled [3,4]. MS has been modified for age. BP (blood pressure), triglycerides and high density lipoproteins (HDL) are more frequently altered variables among children and adolescents [5]. However, defining MS among children and adolescents is not straightforward but it has been suggested that it may be associated with insulin resistance [6]. The development of MS has been suggested to be influenced by the environment, unhealthy lifestyle and diet [7]. Moreover, MS has been reported to be genetically predisposed [8]. The association of visceral obesity and insulin resistance has been suggested. Insulin resistance predisposes individuals with such morbid conditions as cardiovascular disease, diabetes and alcoholic fatty liver disease [9,10].

The high prevalence of overweight and obesity in the Gulf Arab region makes MS a major public health problem that has to be dealt with. Two criteria were used for the definition of MS in this study, the International Diabetes Federation (IDF) and the National Cholesterol Education Program (NCEP) Adult Treatment Panel III modified for age (ATP III). The IDF definition considers central obesity as a prerequisite for MS plus two other parameters, whereas the ATP III definition considers MS when it satisfies at least three of the tested five parameters plus two other parameters, all shown in Table 1 [11-17]. The objective of this study was to assess the prevalence of MS among Kuwaiti adolescent males, using the IDF and ATP III criteria.

Declaration of conflicting interests: None declared.

Keywords: Metabolic Syndrome; Male; Kuwaiti; Prevalence
The prevalence of obesity among Kuwaiti adolescents was reported to be high. The association of obesity with MS has been well established. This study found that the
Table 2. Parameters and MS prevalence among Kuwaiti male students, according to IDF and ATP III criteria.

<table>
<thead>
<tr>
<th>Anthropometric &amp; biochemical parameters</th>
<th>Mean ± SD/range</th>
<th>MS diagnostic criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist circumference (cm)</td>
<td>78.4 ± 15.3</td>
<td>17.7%     IDF</td>
</tr>
<tr>
<td>Triglyceride (mmol/L)</td>
<td>0.97 ± 0.62</td>
<td>8.2%      Modified</td>
</tr>
<tr>
<td>HDL (mmol/L)</td>
<td>1.07 ± 0.29</td>
<td>44.6%     ATP III</td>
</tr>
<tr>
<td>Glucose (mmol/L)</td>
<td>5.2 ± 0.77</td>
<td>16.5%     IDF</td>
</tr>
<tr>
<td>BP (systolic)</td>
<td>122.9 ± 12.0</td>
<td>60.8%     Modified</td>
</tr>
<tr>
<td>BP (diastolic)</td>
<td>80.81 ± 8.53</td>
<td>13.9%     ATP III</td>
</tr>
<tr>
<td>MS prevalence</td>
<td>11.7%</td>
<td>9.8%      Total</td>
</tr>
</tbody>
</table>

MS = Metabolic Syndrome.

Table 3. Sensitivity and specificity of the IDF and the modified ATP III criteria.

<table>
<thead>
<tr>
<th>MS diagnostic criteria</th>
<th>ATP III (+MS)</th>
<th>ATP III (~MS)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDF (+MS)</td>
<td>34</td>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td>IDF (~MS)</td>
<td>25</td>
<td>228</td>
<td>253</td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>238</td>
<td>297</td>
</tr>
</tbody>
</table>

MS = Metabolic Syndrome
Sensitivity of IDF = 58%; PPV = 0.773
Specificity of IDF = 95.7%; NPV = 0.099.

The prevalence of MS among male Kuwaiti adolescents aged 10 - 19 years, being the first of its kind, to be 11.7 and 9.8%, using the IDF and the ATP III criteria, respectively. A comparison between MS prevalence among male Kuwaiti adolescents and other countries, using the two criteria are shown in Figures 1 and 2. Obesity increases the risk of MS by three folds [19]. It is expected that both developed and developing countries will suffer from the MS pandemic [19,20]. In Chinese boys, MS was present 0.2% in normal weight, 6.0% in overweight, and 28.1% in obese adolescents. Obesity and BP were associated with MS [21]. MS was 16 times higher among overweight than normal weight [22]. Among Americans, MS increased to 78.7% among the overweight, 6.8% among the at-risk adolescents (85th - 95th percentile). Low HDL, a parameter of MS in both criteria used in this study, showed the highest increase among Korean males and dyslipidemia was the principal contributor to MS [23].

The literature is devoid of any criterion specific for adolescent Arab populations. Two studies, one conducted in Kuwait, among young adults [24] and the other among adults in Iraq [25], used the available criteria in the literature. Therefore, cut-off points are much needed for adolescents of Arab populations.

Obesity often persists into adulthood, which presents a future risk of type 2 diabetes (T2D) and cardiovascular disease (CVD). Obesity is associated with MS and, therefore, early interventions may reduce the risk of such morbid conditions as CVD and T2D [20]. The high prevalence of MS among male Kuwaiti adolescents requires intervention programs aimed at reducing obesity and decreasing the risk of morbid conditions associated with it.

The findings of this study cannot be generalized to the rest of the male Kuwaiti adolescents because the sample was randomly selected from one intermediate and one secondary school in each of two, out of six, randomly selected governorates, which happened to be populated mostly by urban inhabitants, i.e., the findings in the selected four schools cannot be reasonably generalized to the rest of the population. On the other hand, this bias may be weak because Kuwait is a small country and mostly urban, but it is worth stating this here.

Another possible bias in the results may be related to the low rate, because of the invasive nature of the study,
of parental and/ or students' consent to take part in the study despite the fact that consent forms are given to all students. It is possible that those who gave consent have more health awareness and knowledge about the value of the procedure, if not for now but may be for the future. It will allow them to take the necessary precautions to avoid being at risk of some morbid conditions associated with MS. On the other hand, the high refusal rate may vary with different strata of the population and whether or not the rich or the more educated had higher participation rate or a combination of the whole strata, including the poor or less educated, makes it difficult to be certain that such bias would have affected our results. Furthermore, it is not certain that male Kuwaiti students could always have followed the requirements of coming to school fasting for the previous ten hours and, therefore, carrying out blood tests may not come with ease.

6. ACKNOWLEDGEMENTS

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REFERENCES


