Occupation-related differences in the prevalence of metabolic syndrome

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Objective: To investigate the prevalence of metabolic syndrome in the Spanish working population, and determine how the prevalence varies according to occupation and gender.

Research design and methods: Cross-sectional study of 259,014 workers (mean age 36.4 years; range, 16-74 years; 72.9% males) who underwent a routine medical checkup. The ATPIII (2001) definition for metabolic syndrome was used.

Results: The prevalence of metabolic syndrome was 11.6% (95% CI 11.5-11.7) in males and 4.1% (95% CI 4.0-4.2) in females and increased with age. The prevalence of metabolic syndrome varied in the different categories of occupational activity depending on the gender considered. Among females, the age-adjusted prevalence of metabolic syndrome was higher in blue-collar than in white-collar workers, but this difference was not evident among male workers.

Conclusions: The prevalence of metabolic syndrome varies in the different categories of occupational activity in the Spanish working population. This variation also depends on gender.
There is little information about the prevalence of MS or its components in workers (1). The overall prevalence of the metabolic syndrome (MS) is around 25% in general populations from the U.S. and Europe, including Spain (1-3). Some studies have shown a gender-specific inverse association between measures of socioeconomic status and the prevalence of the MS (2-4). This study aimed to investigate the prevalence of MS in the Spanish working population, and determine whether prevalence differed according to occupational activity and gender.

RESEARCH DESIGN AND METHODS

This study comprises part of the ICARIA (Ibermutuamur CArdiovascular RIsk Assessment) Plan. A detailed description of this plan has been published elsewhere (5). From May 2004 to June 2005, a total of 405,123 workers underwent a routine medical check-up. This study includes the 259,014 workers for whom there was complete information for all items relevant to assess MS. A total of 188,804 (72.9%) were males and 70,210 (27.1%) were females. The mean age of the sample population was 36.4 years (37.0 for males and 34.9 for females). All individuals consented to participate in the study, which was reviewed and approved by the Institutional Review Board.

The specific occupation of workers was classified into nine major categories according to the Spanish National Classification of Occupations-1994 (CNO-94) (6) (Table 1). Workers in the first four categories were grouped as non-manual or white-collar workers, and workers in the last five categories were grouped as manual or blue-collar workers. The Adult Treatment Panel III (ATPIII) definition for MS was used (7). Measurement techniques and data quality control have been previously described (5).

RESULTS

The overall prevalence of MS was 9.5% (95% CI, 9.2-9.8%). The prevalence was higher in males (11.6%; 95% CI, 11.5-11.7%) than in females (4.1%; 95% CI, 4.0-4.2%; \( P < 0.001 \)) and clearly increased with age (Online Appendix Figure A1 which is available at http://care.diabetesjournals.org). Workers with MS were older than workers without MS (mean age 43.4 years versus 35.7 years, respectively; \( P < 0.001 \)).

Table 1 shows the age-adjusted prevalence of MS for specific occupational activities, stratified according to gender. Among females, the prevalence of MS was higher in manual (blue-collar) workers than in non-manual (white-collar) workers \( (P<0.001) \). The lowest prevalence of MS among female workers was found among ‘General managers and government administrators’ (Table 1). In contrast, among males, the prevalence of MS was similar in blue-collar and white collar workers (Table 1). Indeed, the prevalence of MS in the category of ‘General managers and government administrators’ was the highest in male workers, only after ‘Installation and machinery operators, and machine assemblers’ (Table 1). The age-adjusted prevalence of the specific components of the MS in both genders is shown in Online Appendix Table A1.

CONCLUSIONS
This study shows that nearly 10% of Spanish workers can be classified as having MS. The prevalence of MS is higher in males than in females and increases with age. Furthermore, the prevalence of MS varies in the different categories of occupational activity and this variation also depends on gender. The reasons for this finding are not clear. In general populations, low educational level and low income level (2-4) are related to MS among women, but not among men. Women of high socioeconomic status, but not men, tend to be more concerned about their fitness, consume healthy food and practice regular exercise (4). In addition, obesity is less acceptable in high-income women compared with men (3, 8). Indeed, obesity is more prevalent as socioeconomic status declines in women from Western developed countries, but not in men (8).

The overall prevalence of MS observed in the present study is similar to that observed in the Spanish MESYAS registry (using body mass index instead of waist circumference) (1). In the MESYAS study, occupational activities were restricted to three categories, the crude prevalence of MS being 12% in manual workers, 7% in managers, and 6% in office workers (1). In addition, the low number of females and people older than 60 years or younger than 30 years in some categories precluded full age and gender adjustments in that study (1).

A major strength of this study is its large sample size, which allows for a high precision in estimates and multiple stratifications. In addition, the sample provides nationwide representation of workers of both genders from all occupational activities (5). A major drawback is the cross-sectional design, which precludes drawing inferences about causality.

Routine checkups in workers present an opportunity to implement preventive measures, and the results of the present study may serve as a basis for establishing priorities according to gender, and occupational activities.

ACKNOWLEDGEMENTS
The authors wish to thank all the members of the ICARIA (Ibermutuamur CArdiovascular RIsk Asessment) Study Group (5).
REFERENCES
Table 1. Age-adjusted prevalence of metabolic syndrome\textsuperscript{a} in the different occupations\textsuperscript{b}, stratified according to gender.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>% (95% CI)</td>
<td>No.</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td><strong>White Collar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. General managers and government administrators</td>
<td>2,929</td>
<td>14.2 (12.8-15.6)</td>
<td>683</td>
<td>3.6 (2.0-5.2)</td>
</tr>
<tr>
<td>2. Scientific professionals and technicians, and intellectuals</td>
<td>16,405</td>
<td>11.1 (10.6-11.7)</td>
<td>8,702</td>
<td>3.7 (3.2-4.2)</td>
</tr>
<tr>
<td>3. Support technicians and professionals</td>
<td>23,680</td>
<td>12.7 (12.2-13.2)</td>
<td>22,121</td>
<td>4.5 (4.1-5.0)</td>
</tr>
<tr>
<td>4. Clerks and related works</td>
<td>5,080</td>
<td>12.2 (11.2-13.3)</td>
<td>10,631</td>
<td>4.7 (4.0-5.4)</td>
</tr>
<tr>
<td><strong>Blue Collar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Catering and hospitality, personal and security service</td>
<td>9,829</td>
<td>11.3 (10.6-12.0)</td>
<td>10,985</td>
<td>5.9 (5.3-6.5)</td>
</tr>
<tr>
<td>workers, salesmen/women and shop assistants</td>
<td>1,353</td>
<td>11.7 (9.8-13.5)</td>
<td>182</td>
<td>8.9 (4.4-13.4)</td>
</tr>
<tr>
<td>6. Skilled workers in agricultural and fishing industries</td>
<td>55,099</td>
<td>11.5 (11.3-11.8)</td>
<td>3,847</td>
<td>6.8 (5.8-7.8)</td>
</tr>
<tr>
<td>7. Craftsmen/women, and skilled workers in manufacturing,</td>
<td>35,648</td>
<td>15.1 (14.6-15.5)</td>
<td>1,643</td>
<td>5.2 (3.9-6.6)</td>
</tr>
<tr>
<td>construction, and mining</td>
<td>38,114</td>
<td>11.9 (11.5-12.3)</td>
<td>11,139</td>
<td>7.9 (7.4-8.5)</td>
</tr>
</tbody>
</table>

\textsuperscript{a}MS was considered when at least three of the following criteria were present: (a) waist circumference >102 cm in males or >88 cm in females; (b) blood pressure $\geq$130/85 mmHg or previous diagnosis/therapy of hypertension; (c) fasting serum triglycerides $\geq$150 mg/dl ($\geq$1.695 mmol/l); (d) fasting HDL-cholesterol $<40$ mg/dl ($<1,036$ mmol/l) in males or $<50$ mg/dl ($<1.295$ mmol/l) in females; and (e) fasting serum glucose $\geq$110 mg/dl ($\geq$6,1 mmol/l) or previous diagnosis/therapy of diabetes (7).

\textsuperscript{b}Spanish National Classification of Occupations-1994 (Clasificación Nacional de Ocupaciones, CNO-1994) (6).

No.: number of workers in each category.
Percentages are age-adjusted.