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 sex.

RESEARCH DESIGN AND METHODS — This was a cross-sectional study of 259,014 workers (mean age 36.4 years, range [16–74]; 72.9% male) who underwent a routine medical checkup. The Adult Treatment Panel III (2001) definition for metabolic syndrome was used.

RESULTS — The prevalence of metabolic syndrome was 11.6% (95% CI 11.5–11.7) in male subjects and 4.1% (4.0–4.2) in female subjects and increased with age. The prevalence of metabolic syndrome varied in the different categories of occupational activity depending on the sex considered. Among female subjects, 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 sex.

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

RESEARCH DESIGN AND METHODS — This study comprises part of the Ibermutuamur CArdiovascular RIsk Assessment (ICARIA) 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 metabolic syndrome. A total of 188,804 (72.9%) were male and 70,210 (27.1%) were female. The mean age of the sample population was 36.4 years (37.0 for male subjects and 34.9 for female subjects). 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 1994 Spanish National Classification of Occupations, (6) (Table 1). Workers in the first four categories were grouped as nonmanual (white collar) workers, and workers in the last five categories were grouped as manual (blue collar) workers. The Adult Treatment Panel III (ATP III) (2001) definition for metabolic syndrome was used (7). Measurement techniques and data quality control have been previously described (5).

Statistical analyses were performed using the SAS statistical package (SAS Institute, Cary, NC). Prevalences are presented as percentages with 95% CI. Age-adjusted prevalences were calculated by the direct method using the 2004 Spanish working population as the reference. Numbers were rounded to one decimal place. Significance level was set at 0.01.

RESULTS — The overall prevalence of metabolic syndrome was 9.5% (95% CI 9.2–9.8). The prevalence was higher in male subjects (11.6% [95% CI 11.5–11.7]) than in female subjects (4.1% [4.0–4.2]; $P < 0.001$) and clearly increased with age (online appendix Figure A1 [available at http://dx.doi.org/10.2337/dc08-0431]). Workers with metabolic syndrome were older than workers without metabolic syndrome (mean age 43.4 vs. 35.7 years, respectively; $P < 0.001$).

Table 1 shows the age-adjusted prevalence of metabolic syndrome for specific occupational activities, stratified according to sex. Among female subjects, the prevalence of metabolic syndrome was higher in manual (blue-collar) workers than in nonmanual (white-collar) workers ($P < 0.001$). The lowest prevalence of metabolic syndrome among female workers was found among "general managers and government administrators" (Table 1). In contrast, among male subjects, the prevalence of metabolic syndrome was similar in blue- and white-collar workers (Table 1). Indeed, the prevalence of metabolic syndrome in the category of general managers and government administrators was the second

Table 1—*Age-adjusted prevalence of metabolic syndrome in different occupations, stratified according to sex*

Occupation	Male		Female	
	n	% (95% CI)	*n*	% (95% CI)
White collar	48,094	12.8 (12.4–13.1)	42,137	4.7 (4.4–5.0)
General managers and government administrators	2,929	14.2 (12.8–15.6)	683	3.6 (2.0–5.2)
Scientific professionals, technicians, intellectuals	16,405	11.1 (10.6–11.7)	8,702	3.7 (3.2–4.2)
Support technicians and professionals	23,680	12.7 (12.2–13.2)	22,121	4.5 (4.1–5.0)
Clerks and related jobs	5,080	12.2 (11.2–13.3)	10,631	4.7 (4.0–5.4)
Blue collar	1,40,043	13.0 (12.8–13.2)	27,796	7.4 (7.0–7.8)
Catering and hospitality, personal and security service workers, and salesmen/women and shop assistants	9,829	11.3 (10.6–12.0)	10,985	5.9 (5.3–6.5)
Skilled workers in agricultural and fishing industries	1,353	11.7 (9.8–13.5)	182	8.9 (4.4–13.4)
Craftsmen/women and skilled workers in manufacturing, construction, and mining	55,099	11.5 (11.3–11.8)	3,847	6.8 (5.8–7.8)
Machine installers, operators, and assemblers	35,648	15.1 (14.6–15.5)	1,643	5.2 (3.9–6.6)
Unskilled workers	38,114	11.9 (11.5–12.3)	11,139	7.9 (7.4–8.5)

Metabolic syndrome was considered when at least three of the following criteria were present: *1*) waist circumference >102 cm in male subjects or >88 cm in female subjects; *2*) blood pressure ≥130/85 mmHg or previous diagnosis of or therapy for hypertension; *3*) fasting serum triglycerides ≥150 mg/dl (≥1.695 mmol/l); *4*) fasting HDL cholesterol <40 mg/dl (<1.036 mmol/l) in male subjects or <50 mg/dl (<1.295 mmol/l) in female subjects; and *5*) fasting serum glucose ≥110 mg/dl (≥6.1 mmol/l) or previous diagnosis of or therapy for diabetes (ref. 7). Occupations defined by the 1994 Spanish National Classification of Occupations, (ref. 6). Percentages are age adjusted.

highest in male workers, after "installation and machinery operators, and machine assemblers" (Table 1). The age-adjusted prevalence of the specific components of the metabolic syndrome in both sexes is shown in online appendix Table A1.

CONCLUSIONS — This study shows that nearly 10% of Spanish workers can be classified as having metabolic syndrome. The prevalence of metabolic syndrome is higher in male subjects than in female subjects and increases with age. Furthermore, the prevalence of metabolic syndrome varies in the different categories of occupational activity, and this variation also depends on sex. The reasons for this finding are not clear. In general populations, low educational and income levels (2–4) are related to metabolic syndrome in female subjects but not in male subjects. Women of high socioeconomic status tend to be more concerned about their fitness, consume healthy food, and practice regular exercise (4), but this correlation between health practices and economic status does not exist in male subjects. In addition, obesity is less acceptable in high-income female subjects than high-income male subjects (3,8). Indeed, obesity is more prevalent as socioeconomic status declines in female subjects from developed Western countries, but the same relationship does not exist in male subjects (8).

The overall prevalence of metabolic syndrome observed in the present study is similar to that observed in the Spanish Metabolic Syndrome in Active Subjects in Spain (MESYAS) registry (using BMI instead of waist circumference) (1). In the MESYAS study, occupational activities were restricted to three categories, showing crude prevalences of metabolic syndrome of 12% in manual workers, 7% in managers, and 6% in office workers (1). In addition, the low number of female subjects and people older than 60 years or younger than 30 years in some categories precluded full age and sex adjustments in that study (1).

A major strength of this study is its large sample size, which allows for a high preci-

sion in estimates and multiple stratifications. In addition, the sample provides nationwide representation of workers of both sexes 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 sex and occupational activities.

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