Overweight and obesity: a major challenge for coronary heart disease secondary prevention in clinical practice in Europe

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**Aims** To evaluate the management of overweight and obesity in coronary artery disease patients in Europe.

**Methods and Results** The EUROASPIRE Study is a multicentre epidemiological study involving nine European countries. The major cardiovascular risk factors and their management were collected from hospital records and measured at least 6 months after hospitalization during a specific interview. A total of 4863 consecutive records from men and women with coronary artery disease, under 71 years of age, were reviewed. Interviews were obtained for 3569 (73%). Body mass index was computed from height and weight noted in the medical records and measured at interview. Management of overweight and obesity was recorded at interview. At least 6 months after hospitalization, 75% of women and 80% of men were overweight and 33% of women and 23% of men were obese. Height noted in medical records was over-estimated, inducing an under-estimation of obesity in 16% of men and 33% of women. Advice from a nutritionist was offered in less than 20% of obese patients. The same trends were observed in all participating countries.

**Conclusions** Prevalences of overweight and obesity are high in coronary artery disease patients in Europe. A systematic measurement of height and weight is a prerequisite to a better management of this common modifiable risk factor.

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**Key Words:** EUROASPIRE, secondary prevention, coronary artery disease, obesity, overweight, height, nutritionist.

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**Introduction**

Prevention of modifiable risk factors in coronary heart disease remains a major issue worldwide[1–4]. Primary prevention, because of cultural and secular behaviour, is less immediately achievable than secondary prevention. Moreover, risk factor modification after a non-fatal coronary event may be strongly motivated. Secondary prevention is of the highest priority according to the joint European Society recommendations on prevention of coronary heart disease in clinical practice[5]. Several modifiable risk factors are outlined in these recommendations: dyslipidaemia, hypertension, tobacco smoking, diabetes control, overweight and obesity. Among these, overweight and obesity are the easiest to detect, but necessitate a continuous and sustained effort. Obesity is associated with increases in all causes of death and particularly of cardiovascular mortality. Moreover, obesity is related to other risk factors, such as hypertension, dyslipidaemia and non-insulin dependent diabetes, whose deleterious effects act synergistically[6].

All these considerations are now fully accepted by physicians. Our aim was to analyse the level of detection and management of overweight and obesity in European populations of patients with established coronary heart disease. Following the first Joint European society recommendations in 1994[5], recently updated in 1998[7], a large European epidemiological study was launched under the auspices of the European Society of Cardiology, the EUROASPIRE study (EUROpean Action on Secondary Prevention through Intervention to Reduce Events). In nine countries, patients with an established
coronary heart disease were enrolled from hospital admission lists, were interviewed and examined at least 6 months after their initial admission. Levels and management of cardiovascular risk factors were collected and measured. In the present study, we explored the way overweight and obesity were taken into account in medical records, we compared these data with patient anthropometric details, and enquired about the management of these risk factors since admission.

**Population and methods**

**Study population**

The design and protocol of the EUROASPIRE study are described in detail elsewhere[8]. Nine European countries were involved in the study: Czech Republic (CZE/PP), Finland (FIN/KUO), France (FRA/LLR), Germany (GER/MUN), Hungary (HUN/BUD), Italy (ITA/UTV), the Netherlands (NET/ROT), Slovenia (SLO/LJU) and Spain (SPA/BAR). In a defined geographical area in each country, at least 525 consecutive male or female patients (<70 years), including those who died, were identified retrospectively from diagnostic registers, hospital discharge lists or other sources over a period of not less than 6 months and up to 48 months prior to the start of the survey, with the following diagnosis: (i) first elective or emergency coronary bypass grafting (CABG), (ii) first elective or emergency percutaneous transluminal coronary angioplasty (PTCA) without previous CABG, (iii) first or recurrent acute myocardial infarction without previous CABG or PTCA, (iv) acute myocardial ischaemia without previous CABG or PTCA or acute myocardial infarction. In each country, the object was to obtain information on about 400 living patients attending for interview (100 per category). Thus, to allow for deaths and non-response to invitations for interview, at least 525 consecutive patients were identified.

**Data collection**

Data collection was conducted in two stages: first, a retrospective review of hospital medical files; second, an interview and examination of patients performed at least 6 months after their admission. Trained research personnel abstracted data from patient’s medical records and interviewed and examined the patients at hospital or at home using standardized methods and instruments. Patients were invited to this interview by mail and phone and their general practitioner was informed.

Personal and demographic details, personal and family history of coronary heart disease, risk factor recordings and medication were obtained from medical records. Recorded height and weight were collected. The written opinion of the physician on the existence of obesity and the actions proposed to combat this risk factor were extracted from medical files.

At least 6 months after hospitalization, data on personal and family history were collected, height and weight were measured with scales and measuring sticks. Each subject was asked if he/she had been offered any personal advice about weight reduction; if yes, how and by whom, and if he/she had attempted to lose weight.

**Statistical analyses**

Body mass index was calculated as the patients’ weight (in kilograms) divided by the squared height (in metres). Overweight and obesity were defined according to WHO recommendations based on body mass index limits: overweight was defined as body mass index \( \geq 25 \text{ kg} \cdot \text{m}^{-2} \), and obesity as body mass index \( \geq 30 \text{ kg} \cdot \text{m}^{-2} \). Mean and standard deviation of height value differences at admission and at interview were computed. Differences from zero were statistically evaluated according to 95% confidence intervals.

**Results**

A total of 4863 patient records were reviewed. Twenty five percent were women. The age distribution was as follows: \( \leq 50 \text{ years} 23\% \), 51–60 years 33–8% and 61–70 years 43–1%. Interviews were obtained for 73–4% (3569/4863) of the patients. Among those who did not participate in the interview, 5–8% had died, 7–5% were lost to follow-up, 7–3% refused to participate, 3–8% did not respond and 2–2% gave other reasons for not participating. The proportion of obese subjects interviewed and those who were not, as calculated from record data, were identical, respectively, 18% and 19%.

Height was recorded in 86% and weight in 88% of hospital medical files. A systematic significant \( (P<0.001) \) positive difference between height values measured at interview and height values reported in admission records was observed for all countries (Table 1). This difference was +1·1 cm (95% CI=[1·1–1·2]) for men and +2·6 cm (95% CI=[2·3–2·8]) for women.

The prevalence of overweight (Table 2a) and obesity (Table 2b) was computed according to different body mass index calculations obtained by combining height and weight recorded in medical notes, and measurements collected at interview. The lowest prevalences of overweight and obesity were observed at admission and the highest ones at interview. When the height at interview was used to calculate body mass index at admission, intermediate prevalences were observed. Thus, the estimation of overweight subjects was underestimated by 5% and 9% in men and women, respectively; for obesity, this under-estimation was 16% and 33%, for men and women respectively.

Information on personal advice offered to subjects considered as obese at interview were obtained (Table 3). A total of 86% and 82% of obese men and women, respectively, were offered personal advice. However,
populations[10,11]. The EUROASPIRE study tends to disease patients has already been reported in speci
women are overweight and almost one to four are obese.
prevalence detected for women in Hungary, was 60%,
demonstrate that these prevalences, estimated with
hospitalization records, we noticed an over-estimation
In this European study, 23% of men and 33% of women
of height, decreasing body mass index estimations and
self-reported values in medical record and measured at interview
professionally to support obese patients in their weight
help provided by physicians professionally to support obese patients in their weight
loss remains limited: only one to five obese patients were offered advice from a nutritionist.
Whatever the European country, at least 6 months
after a coronary heart disease, 80% of men and 75% of
women are overweight and almost one to four are obese.
This observation of such prevalences in coronary heart
disease patients has already been reported in specific populations[10,11]. The EUROASPIRE study tends to
demonstrate that these prevalences, estimated with standardized protocols, may apply to most European
coronary heart disease patients. The lowest overweight prevalence detected for women in Hungary, was 60%,
while the highest was 87% in Spanish women. Concerning obesity, the lowest prevalence was 16% in Dutch
men and the highest 45% in Finnish women. Although more variable, overweight affected at least three out of
five coronary heart disease patients in Europe. These data underline the impact of overweight and obesity on
heart attack morbidity and mortality[12]. Weight loss in obese patients has an independent effect on coronary
heart disease risk reduction, but also improves lipid plasma distribution, decreases blood pressure levels and
increases glucose tolerance[13]. This impact may be more effective in obese subjects with coronary heart disease.
In the recent recommendations published by the European task forces[7], coronary heart disease patients are given
top priority for action. The EUROASPIRE survey allowed us to estimate the extensive potential for sec-
condary prevention offered by obesity and overweight reduction in Europe.
One major point about obesity compared to other modifiable risk factors, such as hypertension or dyslipida-
demia, is that a patients’ appearance may immediately indicate whether they are affected by the risk factor or
not. However, empirical estimations are not so obvious. Indeed, as in patients with coronary disease, under-
estimation of obesity is also observed in the general population[14] where only 55% of obese women and 60%
of obese men, according to measured values, were correctly classified as such.
This observation strongly argues for a systematic measurement of height and weight in coronary heart
disease patients as a standard and major outcome of any in-
or outpatient examination. This suggestion is re-
inforced by what we observed in height and weight values noted in medical files used to recruit coronary
heart disease patients in EUROASPIRE survey. In all countries, height was over-estimated, mainly due to self-reported values in medical files. This increase in height induced a bias in body mass index estimation and in overweight and obesity prevalences. The systematic measurement of height and weight at admission will correct this bias. From an epidemiological point of view[15], this well known bias has a little impact on correlation and quantitative measurement of body mass index used as a covariate. Conversely, in clinical practice, where thresholds are used, the misclassification will have a serious effect on the potential decision of management.
This prerequisite of secondary prevention is re-
inforced by the low frequency of help provided to obese
patients. For obese subjects at interview, more than 80%
had received advice, but less than 40% received written
material and less than 20% met a nutritionist. If we
consider the recommendations for secondary preven-
tion, to make healthy food choices as one way to help
weight control, the following recommendations are
given as optimal dietary goals: reduction of total fat
intake to 30% and of cholesterol intake to less than
300 mg . day^{-1}; reduction of saturated fats, an increase
in the intake of fresh fruit, cereals and vegetables, a
reduction in total calorie intake and in salt and alcohol

| Table 1 Differences between height values (in cm) noted in medical record and measured at interview |
| --- | --- | --- | --- |
| Centre | n | Mean record | Mean interview | Mean difference and 95% CI |
| **Men** | | | | |
| CZE/PP | 208 | 174.9 | 173.9 | +1.0 [0.7-1.4] |
| FIN/KUO | 277 | 172.2 | 171.3 | +0.9 [0.7-1.0] |
| FRA/LLR | 287 | 172.0 | 170.3 | +1.7 [1.4-2.0] |
| GER/MUN | 301 | 175.1 | 173.6 | +1.5 [1.2-1.8] |
| HUN/BUD | 237 | 172.6 | 171.3 | +1.4 [1.0-1.8] |
| ITA/UTV | 302 | 172.3 | 171.0 | +1.3 [0.9-1.6] |
| NET/ROT | 278 | 176.6 | 175.8 | +0.8 [0.4-1.1] |
| SLO/LJU | 262 | 173.3 | 172.7 | +0.3 [0.0-0.7] |
| SPA/BAR | 271 | 167.2 | 165.9 | +1.2 [0.9-1.6] |
| All men | 2423 | 172.9 | 171.7 | +1.1 [0.9-1.2] |
| **Women** | | | | |
| CZE/PP | 70 | 163.2 | 159.7 | +3.5 [2.5-4.5] |
| FIN/KUO | 129 | 159.9 | 157.6 | +2.3 [1.8-2.7] |
| FRA/LLR | 77 | 160.0 | 156.5 | +3.5 [2.8-4.1] |
| GER/MUN | 81 | 164.0 | 161.0 | +3.0 [2.8-3.8] |
| HUN/BUD | 81 | 165.1 | 162.8 | +2.2 [1.3-3.4] |
| ITA/UTV | 67 | 161.6 | 158.3 | +3.4 [2.5-4.3] |
| NET/ROT | 90 | 162.4 | 162.9 | +1.3 [0.6-2.0] |
| SLO/LJU | 82 | 161.1 | 159.7 | +1.6 [0.8-2.5] |
| SPA/BAR | 35 | 155.4 | 153.2 | +2.2 [0.9-3.6] |
| All women | 724 | 161.5 | 158.9 | +2.6 [2.3-2.8] |
| All | 3147 | 170.3 | 168.8 | +1.5 [1.4-1.6] |

CPE/PP=Czech Republic; FIN/KUO=Finland; FRA/LLR=France; GER/MUN=Germany; HUN/BUD=Hungary; ITA/UTV=Italy; NET/ROT=The Netherlands; SLO/LJU=Slovenia; SPA/BAR=Spain.

Discussion
In this European study, 23% of men and 33% of women
were obese at least 6 months after hospitalization for
coronary heart disease. When we considered the initial
hospitalization records, we noticed an over-estimation
of height, decreasing body mass index estimations and
thus an under-estimation of obesity by 16% in men and
33% in women. Finally, the help provided by physicians
professionally to support obese patients in their weight
loss remains limited: only one to five obese patients were offered advice from a nutritionist.
Whatever the European country, at least 6 months
after a coronary heart disease, 80% of men and 75% of
women are overweight and almost one to four are obese.
This observation of such prevalences in coronary heart
disease patients has already been reported in specific populations[10,11]. The EUROASPIRE study tends to
demonstrate that these prevalences, estimated with standardized protocols, may apply to most European
coronary heart disease patients. The lowest overweight prevalence detected for women in Hungary, was 60%,
only 39% of obese men and 36% of obese women said
they had received written material. Advice from a
nutritionist was offered only in 18% of obese men and
20% of obese women.

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Table 2a  Prevalence of overweight (body mass index \( \geq 25 \text{ kg} \cdot \text{m}^{-2} \)) in percentages by centre and sex

<table>
<thead>
<tr>
<th>Centre</th>
<th>At admission(^{(1)})</th>
<th>At admission(^{(2)})</th>
<th>At interview(^{(3)})</th>
<th>% of the difference*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CZE/PP</td>
<td>78.4</td>
<td>83.3</td>
<td>85.1</td>
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</tr>
<tr>
<td>FIN/KUO</td>
<td>72.1</td>
<td>74.4</td>
<td>76.9</td>
<td>-3</td>
</tr>
<tr>
<td>FRA/LLR</td>
<td>66.9</td>
<td>71.6</td>
<td>78.8</td>
<td>-7</td>
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<tr>
<td>GER/MUN</td>
<td>66.5</td>
<td>72.1</td>
<td>82.4</td>
<td>-8</td>
</tr>
<tr>
<td>HUN/BUD</td>
<td>76.3</td>
<td>79.5</td>
<td>76.0</td>
<td>-4</td>
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<tr>
<td>ITA/UTV</td>
<td>73.9</td>
<td>79.9</td>
<td>83.1</td>
<td>-8</td>
</tr>
<tr>
<td>NET/ROT</td>
<td>58.8</td>
<td>62.5</td>
<td>68.4</td>
<td>-6</td>
</tr>
<tr>
<td>SLO/LJU</td>
<td>80.3</td>
<td>79.5</td>
<td>79.0</td>
<td>+1</td>
</tr>
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<td>SPA/BAR</td>
<td>76.5</td>
<td>79.0</td>
<td>86.0</td>
<td>-3</td>
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<tr>
<td>All men</td>
<td>71.7</td>
<td>75.4</td>
<td>79.5</td>
<td>-5</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CZE/PP</td>
<td>61.8</td>
<td>70.6</td>
<td>75.7</td>
<td>-14</td>
</tr>
<tr>
<td>FIN/KUO</td>
<td>79.1</td>
<td>81.7</td>
<td>84.5</td>
<td>-3</td>
</tr>
<tr>
<td>FRA/LLR</td>
<td>57.9</td>
<td>64.5</td>
<td>70.1</td>
<td>-11</td>
</tr>
<tr>
<td>GER/MUN</td>
<td>64.2</td>
<td>75.3</td>
<td>80.3</td>
<td>-17</td>
</tr>
<tr>
<td>HUN/BUD</td>
<td>61.2</td>
<td>62.4</td>
<td>59.6</td>
<td>-2</td>
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<td>ITA/UTV</td>
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<td>67.2</td>
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<td>SLO/LJU</td>
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<td>75.6</td>
<td>72.0</td>
<td>-9</td>
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<td>SPA/BAR</td>
<td>79.4</td>
<td>88.2</td>
<td>87.2</td>
<td>-11</td>
</tr>
<tr>
<td>All women</td>
<td>66.1</td>
<td>72.2</td>
<td>75.4</td>
<td>-9</td>
</tr>
</tbody>
</table>

\(^{(1)}\)BMI calculated using height and weight as found in record.
\(^{(2)}\)BMI calculated using weight as found in record and height as measured at interview.
\(^{(3)}\)BMI calculated using weight and height measured at interview.
*% of underestimation was calculated between prevalence at admission (1) and at admission (2).
Other abbreviations as in Table 1.

Table 2b  Prevalence of obesity (body mass index \( \geq 30 \text{ kg} \cdot \text{m}^{-2} \)) in percentages by centre and sex

<table>
<thead>
<tr>
<th>Centre</th>
<th>At admission(^{(1)})</th>
<th>At admission(^{(2)})</th>
<th>At interview(^{(3)})</th>
<th>% of the difference*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CZE/PP</td>
<td>23.0</td>
<td>25.5</td>
<td>29.8</td>
<td>-11</td>
</tr>
<tr>
<td>FIN/KUO</td>
<td>17.2</td>
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<td>-20</td>
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<td>GER/MUN</td>
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<tr>
<td>ITA/UTV</td>
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<td>18.4</td>
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<td>-12</td>
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<tr>
<td>NET/ROT</td>
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<tr>
<td>SLO/LJU</td>
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<td>-21</td>
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<tr>
<td>All men</td>
<td>17.4</td>
<td>20.1</td>
<td>23.4</td>
<td>-16</td>
</tr>
<tr>
<td><strong>Women</strong></td>
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<td></td>
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<td>-60</td>
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<td>20.7</td>
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<td>SPA/BAR</td>
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</tr>
<tr>
<td>All women</td>
<td>21.1</td>
<td>28.0</td>
<td>32.7</td>
<td>-33</td>
</tr>
</tbody>
</table>

\(^{(1)}\)BMI calculated using height and weight as found in record.
\(^{(2)}\)BMI calculated using weight as found in record and height as measured at interview.
\(^{(3)}\)BMI calculated using weight and height measured at interview.
*% of underestimation was calculated between prevalence at admission (1) and at admission (2).
Other abbreviations as in Table 1.
use; and an increase in exercise. To offer oral advice, in the course of an in- or outpatient examination, will probably be of little impact. At least some of these recommendations have to be written down. Moreover, the role of a nutritionist, in order to transform this recommendation into applicable daily meals, is compulsory.

As reported from the EUROASPIRE data on overweight and obesity, there is a considerable opportunity for improving secondary prevention of coronary heart disease in Europe, by taking into account and managing this risk factor. Modification of lifestyle is difficult but health promotion trials in high cardiovascular risk individuals has been shown to be effective. Several experiments have been conducted in general practice, more amenable to long-term health promotion of coronary heart disease patients. In Ireland, despite no significant effect on objective cardiovascular risk factors, personal health education of patients with angina tended to increase exercise and improve dietary habits. A randomized trial of the effect of promotion of lifestyle aspects of secondary prevention of coronary heart disease patients in general practice improved patients’ health and reduced hospital admission.

In conclusion, although regularly recommended, overweight and obesity are major modifiable risk factors to fight against. However, four conditions are needed to achieve this major public health goal: firstly, to systematically measure weight and height of coronary heart disease patients; secondly, to derive from these measures the body mass index; thirdly, to make a decision about management of patients with a body mass index ≥25 kg m⁻² and more urgently with a body mass index ≥30 kg m⁻²; fourthly, to give written material to the patients and to agree upon a scheduled prevention programme with a nutritionist. For this lifestyle advice to be effective, a long-term follow-up of the patients is needed, with continuous management from hospital to the general physician’s office.

EUROASPIRE Study Group is grateful to all the hospitals in which the study was carried out. Their administrative staff, physicians, nurses and other personnel helped us in many ways and we very much appreciate this. We are also grateful to the patients who participated in the survey.

The EUROASPIRE study was supported by an educational grant made to the European Society of Cardiology, by Merck, Sharp & Dohme.

### Table 3 Personal advice offered for obese subjects at interview

<table>
<thead>
<tr>
<th>Centre</th>
<th>All advice offered (%)</th>
<th>Advice offered with written materials (%)</th>
<th>Advice offered by nutritionist (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
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</tr>
<tr>
<td>CZE/PP</td>
<td>87</td>
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<td>35</td>
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<td>GER/MUN</td>
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<td>0</td>
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<td>HUN/BUD</td>
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<td>4</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>All women</td>
<td>82</td>
<td>36</td>
<td>20</td>
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Other abbreviations as in Table 1.

References


Appendix

The EUROASPIRE survey was undertaken as part of the initiatives of the joint ESC/EAS/ESH Implementation Group on Coronary Prevention (Chairman: Prof D. Wood. Members: Prof G. De Backer, Prof I. Shepherd, Prof A. Zanchetti). Study centres and other organisations participating in the study, as well as the names of investigators and other research personnel, are listed below. Principal Investigators in each country are indicated by asterisks. Czech Republic 2nd Department of Internal Medicine, Charles University Medical Faculty, Pilsen: P. Haman, K. Linhartova, J. Simon*; Department of Cardiology, Institute of Clinical and Experimental Medicine, Prague: M. Hrnca*, P. Luptinek, T. Marek; Finland Department of Medicine, Kuopio University Hospital, Kuopio: A. Kemppainen, H. Koukkunen, S. Lehto, R. Lehto, K. Pyo*; Kuopio University Hospital, Kuopio: A. Kemppainen, Service d’Angiologie et de Santé Publique/INSERM U 508, Institut Pasteur et CH et U de Lille: S. Danet, R. H. Koukkunen, S. Lehto, R. Lehto, K. Pyo*; Kuopio University Hospital, Kuopio: A. Kemppainen, Service d’Angiologie et de Santé Publique/INSERM U 508, Institut Pasteur et CH et U de Lille: S. Danet, R. H. Koukkunen, S. Lehto, R. Lehto, K. Pyo*. France Service d’Épidémiologie et de Santé Publique/INSERM U 508, Institut Pasteur et CH et U de Lille: S. Danet, R. Domanievicz, B. Lemaire, M. Lenoir, M. Montaye, P. Amouyel*. Hôpital Cardiologique Universitaire, Lille: Hôpital Saint-Philibert, Lomme et Hôpital de Roubaix, Roubaix; Germany Department of Epidemiology and Social Medicine, University of Münster: U. Broxtermann, M. Heimbach, A. Liese, U. Keil*; Department of Medicine, Clinic for Cardiology and Angiology, A. Enbergs, G. Breithardt, Department of Chest and Cardiac Surgery: H. H. Sehgal. St Franziskus Hospital, III Medizinische Abteilung. Münster: P. Kleine-Kathöhfer. Hungary Hungarian Institute of Cardiology: S. Borbas, M. Podmaniczky, E. Östör*, Internal Department, Szt Janos Municipal Teaching Hospital; A. Janosi, A. Bradak, A. Belatiny Kenëz; Italy First Department of Internal Medicine, Venice City Hospital, Venice: C. Leprotti, G. B. Ambrosio*; Department of Cardiology, S. M. Misericordia Hospital, Udine: D. Vanuzzo, L. Pilo. Department of Cardiology, Ca’ Foncello Hospital, Treviso (Head of Department: P. Stritoni): A. Pedrocchi, F. Perissinotto; Department of cardiology, Borgo Trento Hospital, Verona (head of Department: P. Zardini): A. Gallo, L. Rossi. Netherlands Thorax Centre, University Hospital Dijkzigt, Rotterdam: F. Post, J. W. Deckers*. Sint Franciscus Gasthuis, Rotterdam: A. de Boer, M. R. Veerhoek, E. Stockx. Zuidziederzienhuis, Rotterdam: R. van de Berg, W. J. Remme, R. van Vliet. Slovenia Department of Cardiology and Cardiovascular Surgery, University Medical Centre, Ljubljana: K. Marn, V. Salapure, J. Turk*. Spain Institute of Health Studies: G. Paluzie, I. Perez, T. Puig, C. Varas, S. Sans*. Department of Cardiology, Hospital de la Sant Creu i Pau, Barcelona: A. Bayes de Luna. Department of Cardiology, Hospital Clinic i Provincial, Barcelona: F. Navarro López. Consorci Hospitalari parc Taulí, Sabadell: P. Monras. Co-ordinating and data management centre: Cardiac Medicine, Clinical Epidemiology Group, National Heart and Lung Institute, Imperial College School of Medicine, Imperial College of Science, Technology and Medicine, London, UK: T. Bowker, J. Ingham, N. McLennan, B. Schofield and D. Wood. Computing and Statistical Centre Department of Public Health University of Ghent, Belgium: G. De Backer and D. De Bacquer. Biological analyses: Central Laboratory Clinical Research Laboratories (CRL) Europe, Zaventem Belgium: D. James. Scientific Steering Committee: G. Ambrosio (Venice, Italy), P. Amouyel (Lille, France), G. De Backer (Ghent, Belgium), J. Deckers (Rotterdam, The Netherlands), I. Graham (Dublin, Ireland), F. Gutzwiller (Zürich, Switzerland), U. Keil (Münster, Germany), E. Östör (Budapest, Hungary), K. Pyörälä (Kuopio, Finland), Chairman, S. Sans (Barcelona, Spain), J. Simon (Pilsen, Czech Republic), J. Turk (Ljubljana, Slovenia), D. Wood (London, United Kingdom).