Prevalence of cardiovascular risk factors in a French population

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Study on the identification of cardiovascular risk factors Identification of cardiovascular risk factors and the estimation of their prevalence in different populations is an important aim of preventive medicine. We analysed the data from 58 803 volunteers who were subjected to systematic health examinations in the Centre d'Investigations Préventives et Cliniques in Paris during the period January 1991 to December 1993. In this report we present some results concerning the prevalence of the major cardiovascular risk factors and their associations with sex, age and the presence of hypertension.

Conclusions The present study clearly shows that before the age of 55 years, the prevalence of risk factors is higher in men than in women, whereas in postmenopausal women the risk-profile increases rapidly, reaching the level of men after the age of 65 years. The presence of multiple risk factors is much higher in hypertensive than in normotensive individuals. We also observed that more than two-thirds of the treated hypertensives had systolic/diastolic blood pressure levels of >140/90 mmHg. These observations could contribute to the debate regarding the evaluation of global risk and therapeutic strategies in cardiovascular disease prevention. *J Hypertens 16 (suppl 1):S85–S790 © 1998 Rapid Science Ltd*

Introduction

Cardiovascular disease represents a major cause of morbidity and mortality in industrialized countries, with considerable social and economic consequences. Identification and treatment of the major risk factors are the main aims of preventive medicine [1,2]. Their approaches can be considered in terms of primary or secondary prevention. Primary prevention concerns individuals showing no symptoms and aims at identifying, using environmental data and screening examinations, those at high risk in order to propose non-pharmacological treatments or drug therapies, or both. Secondary prevention concerns individuals who have already presented with a symptom or a clinical accident, and proposes treatments for the factor(s) involved in their disease.

Because of issues of public health and economics, cardiovascular prevention occupies a preponderant place for several reasons: (1) the multiplicity of risk factors – arterial hypertension, dyslipidaemia, diabetes, tobacco, stress, etc.; (2) the interactions of genetic and environmental factors in the expression of these risk factors or their complications, or both; (3) the high prevalences of these risk factors in the total population (10–20%, depending on the risk factor), which increase in ageing populations to reach 50–60% in some cases; (4) the very costly overall management of care after clinical accidents (and their aftermaths) resulting from risk factors; and (5) the increasing cost of preventive medicine caused by the large number of individuals with risk factors, and of the development of multiple diagnostic and therapeutic tools to fight them.

With these factors in mind and taking medical, scientific and economic data into consideration, public health in general, and more specifically the cardiovascular discipline, is expected to move (medium and long term) towards achieving a more targeted prevention of disease in individuals with high degrees of risk. Interestingly, in some countries proposed guidelines for treating individuals with mild-to-moderate hypertension are based on the estimated 10-year absolute risk of a cardiovascular complication [3]. Although this therapeutic approach is still controversial [4,5], it points to the necessity for the estimation of the total impact of risk factors and the evaluation of the global cardiovascular risk. This global approach could optimize the benefit of cardiovascular disease management, both for the patient and in terms of public health.

An important step for the global risk approach is to identify in each population the prevalence of the different risk factors and their associations. The French Public Health System (Securité Sociale-Caisse National d'Assurance Maladie) has proposed to give all working and retired persons and their families a free health examination every 5 years. The Centre d'Investigations Préventives et Cliniques (IPC) is one of the largest medical centres in France, having performed 20 000/ year of these examinations in persons living in the Paris area since 1970 [6–8].

We analysed the data of the screening of 58 803 individuals who were subjected to systematic health examinations in the IPC during the period January 1991 to December 1993. In

this report we present results concerning the prevalence of the major risk factors and their associations with sex, age and the presence of hypertension.

Subjects and methods

During the period January 1991 to December 1993, 58 803 individuals were examined in the IPC. The sex ratio of men to women was 1.7 with 37 315 men (63%) and 21 488 women (37%). All participants were volunteers and in apparently good health. The age (mean ± SD) was 44.1 ± 12.1 years. Figure 1a shows the age distribution in the two sexes in this population compared with that in the general population (data from the National Institute of Statistics and Epidemiology). As expected, from the characteristics of this population (mainly working people) the very young and the very old are underrepresented in this cohort. The age distribution was similar in men and women (Fig. 1b).

Supine blood pressure was measured by a nurse in the right arm using a manual sphygmomanometer. After a 10-min rest period, pressure was measured three times and the mean of the last two measurements was calculated. Korotkoff phases I and V were used to define systolic blood pressure (SBP) and diastolic blood pressure (DBP), respectively. Smoking status was assessed with a self-administered questionnaire with dichotomic (yes or no) questions regarding tobacco use. Plasma cholesterol was measured using a Technicon SMA 12 (Technicon Instruments, London, England).

The following definitions were used to identify the different risk factors: (1) hypercholesterolaemia – total cholesterol >2.5 g/l or on cholesterol-lowering treatment, or both; (2) hypertension – SBP >160 mmHg, DBP >95 mmHg, or on antihypertensive treatment, or a combination of these; (3) smoking – consumption of more than 10 cigarettes per day, or equivalent in pipes or cigars, or a combination of these; (4) diabetes – diabetes mellitus declared in the questionnaire or treatment for diabetes mellitus, or both; (5) obesity – body mass index >26 kg/m^2 for women and >27 kg/m^2 for men; (6) familial history of myocardial infarction – myocardial infarction before 60 years of age in father, mother, brother or sister; and (7) personal history of coronary heart disease – angina or myocardial infarction in personal history.

Results

Prevalence of the different risk factors with respect to age and sex

Table 1 shows that the prevalences of the major risk factors (hypertension, high cholesterol, smoking, diabetes mellitus, obesity) were higher in men than in women ($P < 0.001$). In men current tobacco smoking was the most frequent risk factor (28.1%), followed by hypercholesterolaemia (26.6%) and obesity (24.1%). In women hypercholesterolaemia was the most frequent risk factor (21.9%), followed by obesity (19.6%), whereas tobacco consumption was the third most common risk factor (16.8%). Hypertension was present in 11.3% of men and 9.7% of women. However, when hypertension was defined as SBP ≥140 mmHg or DBP ≥90 mmHg, or both, it became the most common risk factor both in men and in women (36% in men and 25% in women).

As shown in Figure 2, 26% of the men and 18% of the women presented with at least two risk factors ($P < 0.001$). As expected, in both sexes the percentage of patients with multi-

Figure 1.

(a) Distribution (%)
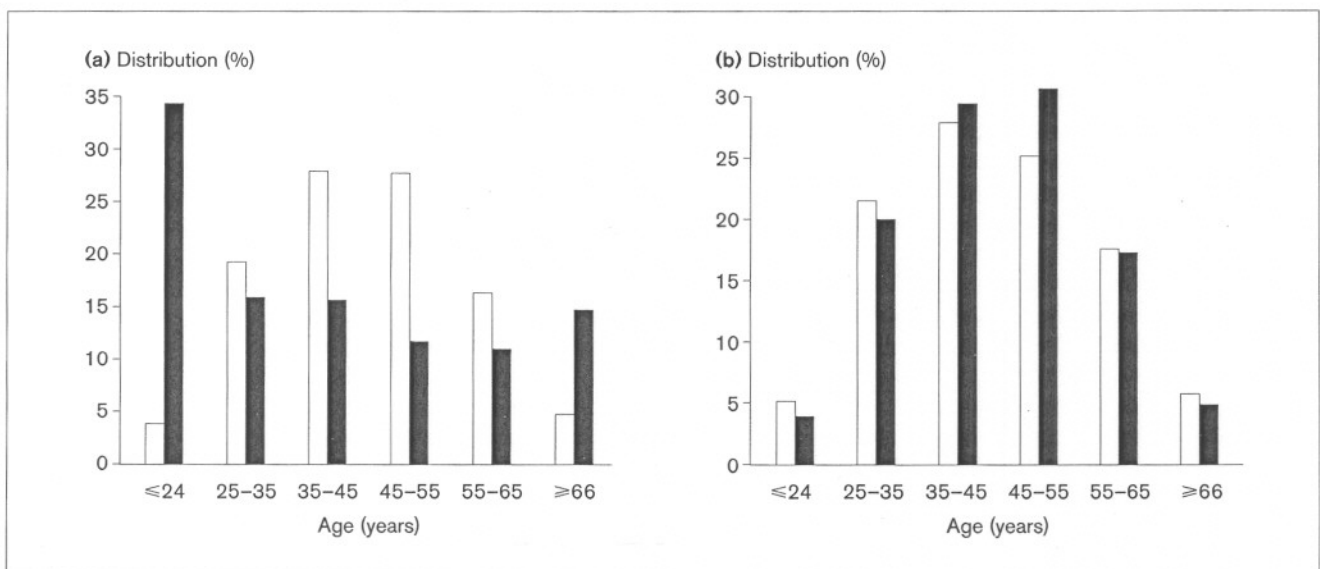
(b) Distribution (%)

(a) The age distribution of the two sexes in the population studied (white column) compared with that the general population (black column). As expected, from the characteristics of this population (mainly working people) the very young and the very old are under-represented in this cohort. (b) The age distribution was similar among men (black column) and women (white column).

ple risk factors increased with age (Fig. 3). Interestingly, differences between men and women in the prevalence of multiple risk factors were observed up to age 55 years, after which the prevalences were very similar. As shown in Figures 4, 5 and 6, the prevalences of the different risk factors increased with age in both sexes. Tobacco consumption was the only risk factor that decreased with age (not shown). The most striking interaction between age and sex was observed for the cholesterol levels (Fig. 4); men showed higher cholesterol levels up to age 55 years than women ($P < 0.001$, versus women). After this age we observed an important increase in the prevalence of hypercholesterolaemia in women but little change in men, leaving a significantly higher percentage of women over age 55 years with high cholesterol ($P < 0.001$, versus men of the same age). The prevalence of hypertension was higher in men up to age 55 years, but this sex-related difference disappeared with older age (Fig. 5). As observed for cholesterol, the age-related increase in hypertension prevalence is stronger in women, but the interaction between sex and age is less marked in hypertension than in high cholesterol. Finally, the prevalence of diabetes mellitus increased with age in both sexes, with a more abrupt slope in men (Fig. 6).

Prevalence of hypertension and its association with other risk factors.

As shown in Table 1, the prevalence of hypertension was 9.7% in women and 11.3% in men. Moreover, 15% of women and 25% of men presented with blood pressure values between 140 and 160 mmHg for SBP and between 90 and 95 mmHg for DBP. Half of the hypertensive individuals were receiving antihypertensive treatment (Table 2). Among these individuals, fewer than one-third can be considered as well controlled by treatment. Thus, of treated individuals 69% of the women and 76% of the men presented with blood pressure levels higher than 140/90 mmHg, and approximately one out of four treated individuals had blood pressure values higher than 160/95 mmHg.

Figure 7 shows the prevalence of other risk factors in hypertensive individuals. Only 13% of male and 20% of female hypertensive individuals had no other major risk factor. Approximately one-half of the hypertensive individuals presented with one more risk factor, and the other individuals had at least two other risk factors. The prevalences of hypercholesterolaemia and diabetes mellitus were significantly higher in hypertensive than in normotensive individuals, and these differences were significant even after adjustment for age (Table 3). On the contrary, tobacco consumption was significantly lower in hypertensive individuals.

Discussion

In the present analysis we evaluated the major risk factors in a large population of volunteers living in the Paris area who

Table 1 Percentage of women and men with cardiovascular risk factors

|	Women (%)	Men (%)	Total (%)
High cholesterol	21.9	26.6*	24.9
Smokers	16.8	28.1*	24.0
Obesity	19.6	24.1*	22.4
Hypertension	9.7	11.3*	10.6
Family history of myocardial infarction	8.8	7.4*	7.9
Diabetes	1.0	1.3*	1.2
Personal history of coronary heart disease	0.4	0.9*	0.7

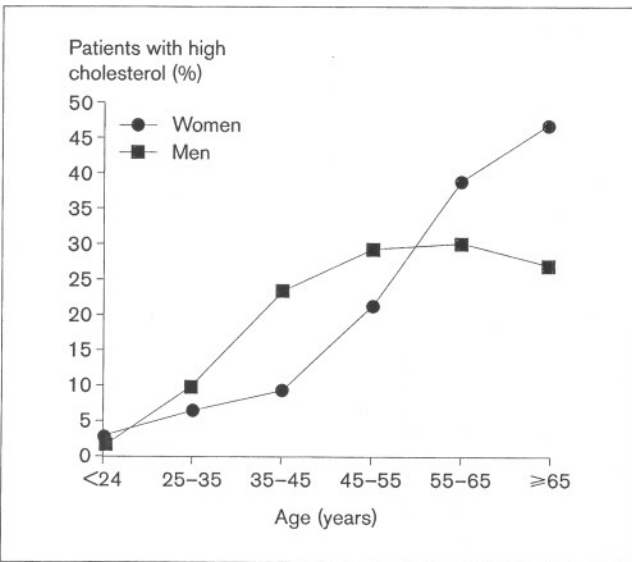*$P < 0.001$, versus women, by χ^2-test.
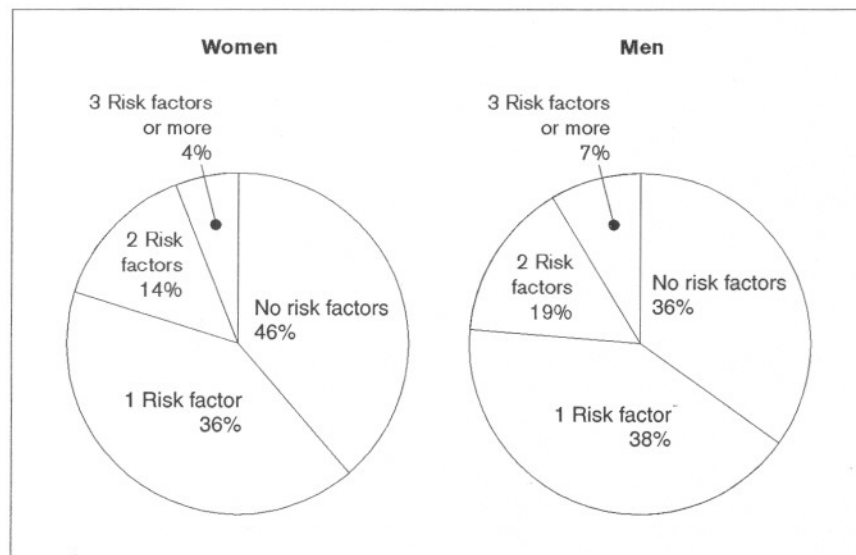
Figure 2.

Percentage of men and women with 0, 1, 2, or more cardiovascular risk factors in the French population studied.

Figure 3.
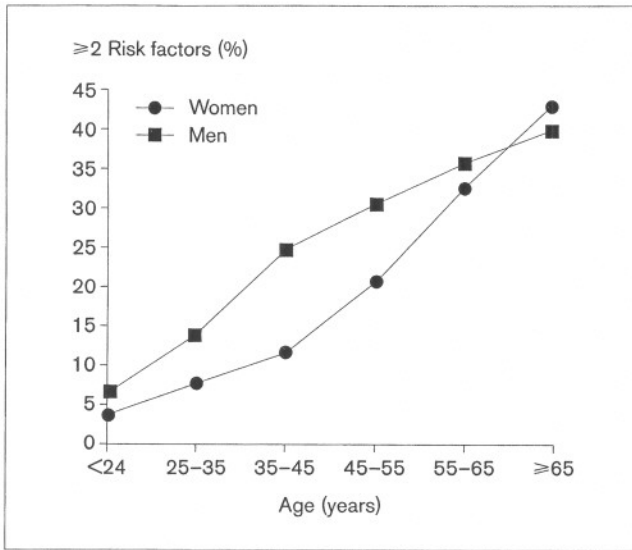
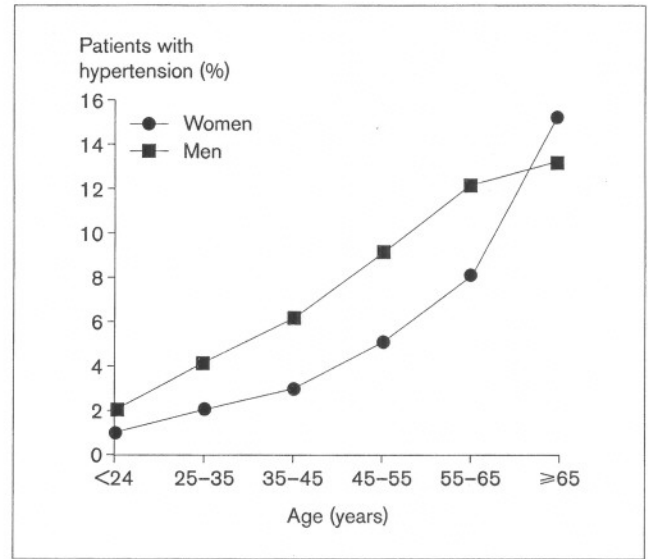Percentage of individuals with two or more risk factors according to age and sex.

Figure 4.

Percentage of individuals with total cholesterol >2.5 g/l (with or without treatment) according to age and sex.

Figure 5.

Percentage of individuals with systolic blood presure >160 mmHg or diastolic blood pressure >95 mmHg, or both (with or without treatment), according to age and sex.

Figure 6.

Percentage of individuals with diabetes mellitus according to age and sex.
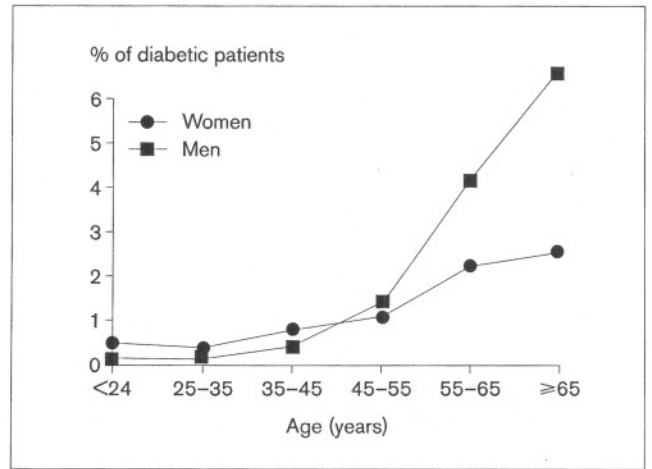
were subjected to a systematic health examination. Although we can consider this cohort as a low-risk population, the prevalences of the different risk factors were relatively high; 25% of individuals had high cholesterol levels, 11% had high blood pressure, 24% were current smokers, 22% were overweight and 1.2% had diabetes. Of the population 23% presented with at least two major risk factors.

As expected the prevalences of risk factors dramatically increased with age. The age-related effects were more pronounced in women than in men. A number of epidemiological studies [9] have clearly shown that women present with a low-risk profile for cardiovascular disease, especially for coronary complications, and that this sex-related difference disappears after age 60–65 years. In a recent analysis [10] we confirmed that women examined in the IPC Centre have a threefold lower mortality than men of the same age. The present study clearly shows that in postmenopausal women

Table 2 Presence of arterial hypertension in the 58 803 individuals studied

	Number	% Among hypertensives	% In cohort
Hypertensives	6211	100	10.6
Untreated	3108	50	5.3
Treated	3103	50	5.3
Blood pressure among treated hypertensives			
<140/90 mmHg	831	13	1.4
140–160/90–95 mmHg	1525	25	2.6
>160/95 mmHg	747	12	1.3

Hypertension was defined as systolic blood pressure >160 mmHg, diastolic blood pressure >95 mmHg or on treatment, or a combination of these. Half of the individuals were treated, and among these only a small percentage had normalized blood pressure levels.

Table 3 Prevalence of other risk factors in normotensive and hypertensive individuals

|	High cholesterol (%)	Tobacco smoking (%)	Diabetes (%)
Normotensives	22.40	24.97	0.72
Hypertensives	44.49*	16.62*	3.98*

*$P < 0.0001$, versus normotensive individuals.

the risk profile increases rapidly, reaching the level in men after age 65 years. Among the different risk factors, cholesterol seems to be the more influenced by age in women than it is in men.

The prevalence of hypertension in the present cohort is similar to that previously reported by others [11]. In most countries 15–25% of the adult population are found at screening to have increased blood pressure, and most of them present with a mild elevation in blood pressure [12]. Among these, only a small percentage are receiving an antihypertensive treatment. Screening studies like the present investigation can not provide any conclusions regarding which patients should be treated. However, we point out that among treated individuals, more than 70% had blood pressure levels higher than 140/90 mmHg. Although this study has many limitations (recruitment bias, single measurements), the results may reflect a hesitation of many physicians to try to achieve lower blood pressure levels in their patients.

It is well established now that among individuals with hypertension, cardiovascular risk depends both on the blood pressure level and on the presence of other risk factors or target organ damage, or both [12]. The increased prevalence of hypercholesterolaemia and diabetes in hypertensive compared with in normotensive individuals is in agreement with the concept that in a large number of individuals, elevations in blood pressure and metabolic disturbances may be caused by the same initial factor.

Moreover the highly frequent association of hypertension with other risk factors should be considered in therapeutic strategies for at least two reasons. First, this approach can help to target the use of antihypertensive drugs to individuals who are at high risk (absolute risk strategy for starting treatment). Second, evaluation of the other risk factors can help with the choice of drug class in order to avoid any drug-related deleterious effect on concomitant risk factors, mainly metabolic parameters.

The screening of a large cohort of more than 58 000 persons living the Paris area, and undergoing systematic health examination, clearly shows the necessity of the evaluation of the global cardiovascular risk in hypertensive individuals. Two main observations can be made concerning hypertensive in-

Figure 7.
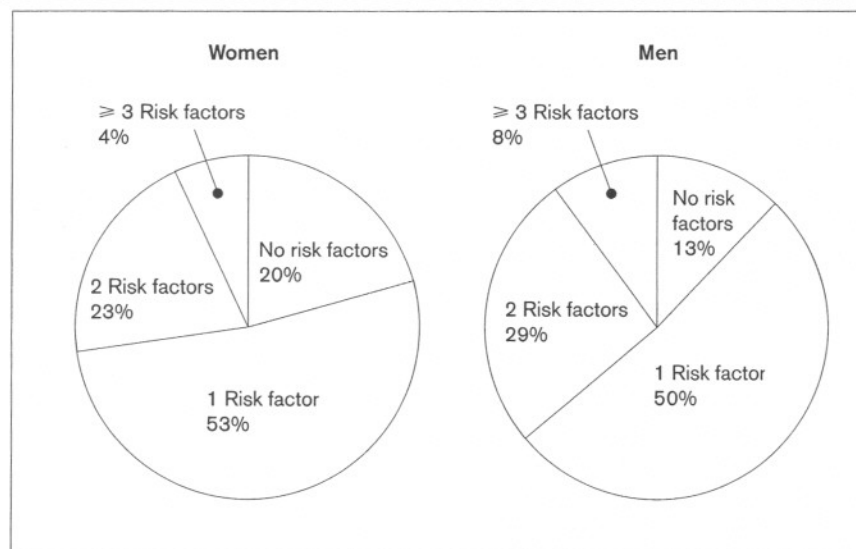
Number of associated risk factors in hypertensive individuals.

dividuals: more than two-thirds of the treated hypertensive individuals had high blood pressure levels and more than three-quarters of the hypertensive individuals presented with concomitant risk factors.

These observations could contribute to the debate about the factors responsible for the relative failure of antihypertensive treatment in the primary prevention of coronary heart disease.

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