Original articles
People's perception of their overall coronary risk: an Italian experience

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Background. **Strategies to prevent cardiovascular diseases are still not widely applied. It is vital to involve people for effective prevention, and knowledge of their own coronary risk is a first step. Little is known about how people perceive their coronary risk. For this reason, we examined this perception in a sample of the general population and compared it with a reference risk chart.**

Methods. **We invited the population of two small towns to come for a free check of their blood pressure and blood cholesterol levels. People were first asked to complete a self-administered questionnaire grading their perceived risk of developing a coronary event. Then, basic data were collected for calculating their risk according to a reference chart.**

Results. **A total of 877 individuals (382 males, 495 females, age 30-80 years) without ischemic heart disease completed the questionnaire and had their blood pressure and cholesterol checked. Many important risk factors are still not taken into account by patients, particularly male sex, older age and diabetes. One out of 4 subjects underestimates his level of coronary risk and 9 out of 10 high-risk subjects are not even aware of it.**

Conclusions. **Our study shows that large numbers of persons are still unaware of their level of coronary risk and of its major determinants. Better counseling by general practitioners is needed since a realistic perception of risk is essential for reducing it.**

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Introduction

Ischemic heart disease (IHD) is one of the most important causes of morbidity and mortality in the western world. The risk of IHD is influenced by numerous risk factors including diabetes, cigarette smoking, arterial hypertension, elevated plasma cholesterol, family history, sex and age. Each person's overall risk depends on the number and the level of risk factors present[1].

Evidence is mounting that the treatment of modifiable risk factors and better health lifestyle habits can prevent cardiovascular diseases[2-5] but for effective prevention the subjects at risk must be involved. Awareness of risk factors and of the level of overall cardiovascular risk is the first basic step. However, very few studies have investigated patients' perception of their cardiovascular risk[6-9].

Our study evaluated the perception of coronary risk in a sample of the general population and compared the global "subjective" risk with that indicated by a reference risk chart[10,11].

Methods

We organized an event in which the population was invited to have their blood pressure (BP) and cholesterol level checked in Riva del Garda and Arco, two small towns in the Trentino region close to Lake Garda. This was done simultaneously in the two towns on a Sunday morning of September 2002 from 9:00 to 12:00 a.m. During the week before, the event was widely publicized with notices in the local newspapers and television, posters and leaflets.

BP was measured and cholesterol assayed by trained professional nurses in a "tent" in the main squares of Riva and Arco, where we arranged a total of 30 checkpoints. BP was measured after 2 min with the subject seated, in accordance with the 1999 WHO-ISH guidelines for the manage-

ment of hypertension[12], using a calibrated mercury sphygmomanometer. Systolic and diastolic BP was recorded at the first and fifth Korotkoff phases. When the systolic or diastolic BP was above the normal limits (≥ 140/90 mmHg), BP was measured again after 2 more min and the latter value was considered for evaluation. Blood samples for total cholesterol tests were obtained from a fingertip with an automatic lancing device and the measurements were made using an Accutrend® Cholesterol Roche instrument (Mannheim, Germany).

Before entering the tent, people were asked to complete a self-administered questionnaire, providing the following data: age, sex, weight and height, educational level, smoking habit, usual BP (if known), usual plasma total cholesterol level (if known), history of diabetes or IHD, prescriptions of antihypertensive or cholesterol-lowering drugs, timing of the last BP and cholesterol measurements, and general practitioner examination. People then had to assess their own overall coronary risk, answering the following question: "How do you assess your probability of developing myocardial infarction (or an event such as angina pectoris, or needing coronary bypass surgery) in the next 10 years: very high, high, moderate, mild or low?".

Statistical analysis. Descriptive results are expressed as numbers of individuals and percentages. To identify the variables independently associated with the subjects' higher risk grading, considered as a categorical outcome in five levels (low, mild, moderate, high and very high), we used an ordinal logistic regression model for discrete ordered outcome. This model allows to assess an overall risk for subjects perceiving themselves as being at higher risk, considering the following categorical variables as risk factors: age ≥ 65 years, male sex, history of diabetes mellitus, prescription of antihypertensive or lipid-lowering drugs, cigarette smoking, overweight (body mass index from 25 to 29 kg/m^2), obesity (body mass index ≥ 30 kg/m^2), low educational level, time since last medical visit ≥ 6 months, BP or cholesterol level unknown. The results are expressed as odds ratio with 95% confidence intervals.

The comparison between subjects' risk grading and the 10-year absolute risk of coronary events calculated with the reference chart[10,11] was performed for subjects aged 45-74 years (638 subjects) with all data required for the scoring (age, sex, systolic BP and blood total cholesterol measurements, history of diabetes and cigarette smoking). We compared low, mild, moderate, high and very high subjective risk gradings with the 10-year chart-estimated risk of coronary events: < 3, 3-4, 5-9, 10-19 and ≥ 20% respectively.

Additional analyses were performed to investigate the factors leading subjects to underestimate their risk, where the outcome was lower than the chart risk estimate vs all the other estimates (agreement plus overestimation). We used a model of logistic regression analysis to assess which factors were independently associ-

ated with the individuals' underestimation of risk, including the variables mentioned above. Statistical analyses were performed using the statistical Package SAS® (SAS Institute, Cary, NC, USA).

Results

Nine hundred and seventy questionnaires were completed. Twenty-nine subjects aged < 30 years and 64 patients with a history of IHD were excluded. The analysis was hence performed on 877 subjects (495 females and 382 males, mean age 57.9 ± 12.8 years, range 30-89 years). Their main characteristics are summarized in table I. The average systolic/diastolic BP and total cholesterol were respectively 138.7 ± 18.7/ 83.7 ± 8.7 mmHg and 208.7 ± 42.4 mg/dl. A total of 542 subjects (61.8%) had a BP ≥ 140/90 mmHg and 494 (56.3%) a cholesterol level ≥ 200 mg/dl. The numbers of persons receiving antihypertensive and cholesterol-lowering drugs were respectively 179 (20%) and

Table I. Characteristics of the population (n = 877).

Sex	
Male	382 (44%)
Female	495 (56%)
Age (years)	
30-39	105 (12%)
40-49	119 (13%)
50-59	200 (23%)
60-69	285 (32%)
70-79	143 (16%)
≥ 80	25 (3%)
Education*	
Primary school	209 (24%)
Secondary school	337 (40%)
High school	261 (31%)
University	43 (5%)
Cigarette smoking	
Non-smokers	570 (65%)
Ex-smokers	153 (17%)
< 10 cigarettes/day	70 (8%)
10-20 cigarettes/day	68 (8%)
≥ 20 cigarettes/day	16 (2%)
Weight* (kg/m^2)	
BMI < 25	372 (49%)
BMI 25-29	298 (40%)
BMI ≥ 30	81 (11%)
Diabetes	27 (3%)
Hypertension in pharmacological treatment	179 (20%)
Blood pressure known to the patient	649 (74%)
Last blood pressure measurement within 6 months	580 (67%)
Hypercholesterolemia in pharmacological treatment	88 (10%)
Cholesterolemia known to the patients	482 (55%)
Last cholesterol measurement within 6 months	297 (35%)
Last medical visit within 6 months	430 (49%)

BMI = body mass index. * data on the educational level and BMI were missing in 27 and 126 cases respectively.

88 (10.0%). Twenty-seven subjects (3.1%) were diabetics and 154 (17.6%) cigarette smokers.

Overall, 291 subjects (33.2%) judged themselves as being at low cardiovascular risk, 195 (22.2%) at mild risk, 310 (35.3%) at moderate risk, 68 (7.8%) at high risk, and 13 (1.5%) at very high risk of coronary events.

Coronary risk estimates by the subjects and from the reference chart could be compared for 638 persons aged 45-74 years: 283 (44.4%) males and 355 (55.6%) females, mean age 60.8 ± 7.5 years, range 45-74 years. Overall, the 10-year coronary risk of this population estimated from the reference chart was < 3% for 44.8%, from 3 to 4% for 17.9%, from 5 to 9% for 29.3%, from 10 to 19% for 7.2%, and ≥ 20% for 0.8% of the participants in this study.

Figure 1 compares the subjective risk perceptions with the risk calculated using the reference chart: 260

persons (41%) overestimated their risk; 207 (32%) evaluated the risk correctly, and 171 (27%) underestimated the risk. Of the 51 subjects with a 10-year risk of coronary events ≥ 10%, only 3 (5.8%) provided a correct evaluation; the remaining 48 (94.1%) underestimated their risk. Just as the others, even the latter had had a recent medical examination or BP and cholesterol measurements (Fig. 2).

Obesity or overweight, the prescription of antihypertensive drugs and/or lipid-lowering drugs and cigarette smoking (Table II) were the variables independently associated with a higher risk perception; an unknown BP and cholesterol level were associated with a lower perception.

Male sex, older age (≥ 65 years), a history of diabetes and a low educational level were the variables associated with an underestimation of the coronary risk

10-year risk of coronary events	Subjects' risk grading					
	low	mild	moderate	high	very high	total
< 3%	100	66	100	17	3	286
3-4%	36	28	36	11	3	114
5-9%	55	32	76	21	3	187
10-19%	14	9	20	3	0	46
≥ 20%	2	1	1	1	0	5
total	207	136	233	53	9	**638**

■ overestimation (260, 41%)   ■ agreement (207, 32%)   ▨ underestimation (171, 27%)

Figure 1. *Subjective coronary risk perception and the risk calculated using the Italian reference chart (the values are numbers of subjects).*

■ 48 subjects at high cardiovascular risk who underestimated their risk level
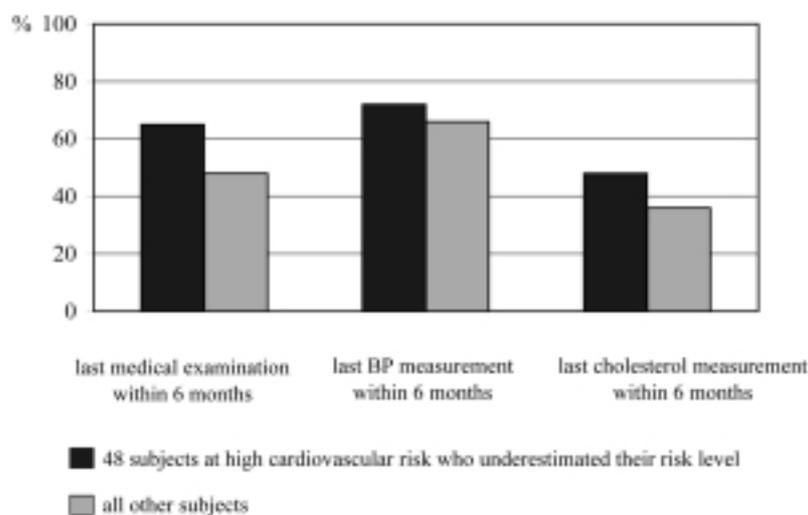
▨ all other subjects

Figure 2. *Time since last medical visit and measurement of blood pressure (BP) and cholesterol levels in high-risk subjects who underestimated their risk.*

Table II. Variables independently associated with the subjects' higher perception of their coronary risk (low, mild, moderate, high, very high). Results of multiple logistic regression analysis.

Variables	OR (95% CI)	p
Obesity (BMI ≥ 30 kg/m^2)	2.99 (1.89-4.75)	0.0001
Antihypertensive treatment	2.19 (1.56-3.10)	0.0001
Lipid-lowering treatment	1.91 (1.23-2.95)	0.0037
Cigarette smoking	1.68 (1.21-2.33)	0.0019
Overweight (BMI 25-29 kg/m^2)	1.45 (1.10-1.92)	0.0085
Unknown blood pressure and cholesterol levels	0.75 (0.58-0.97)	0.0296

BMI = body mass index; CI = confidence interval; OR = odds ratio. The variables included in the model were: sex, age ≥ 65 years, diabetes, low educational level, last medical examination within the last 6 months. An OR > 1 means that the variable is associated with a higher perception of coronary risk, and an OR < 1 means that the variable is associated with a lower perception of coronary risk.

compared to that calculated using the reference chart; antihypertensive treatment was the only variable in the model that was independently associated with an overestimation of the coronary risk (Table III).

Discussion

Many studies show that most cardiovascular diseases are preventable but preventive strategies are still not extensively and effectively applied in subjects at risk. The adherence to lifestyle guidelines regarding diet, exercise and abstinence from smoking is associated with a very low risk of coronary heart disease, but only a small proportion of the population follows them[3]. In addition, although the pharmacological treatment of hypertension, hypercholesterolemia and diabetes is efficacious, the control of BP, cholesterol and glucose levels is still unsatisfactory in the majority of treated individuals[13,14].

Patient involvement is decisive for prevention. The awareness of the existing risk factors and knowledge of the overall level of cardiovascular risk is the first basic step. Jones et al.[15] showed that a good knowledge of the risk factors by subjects and their doctors is at the root

Table III. Variables independently associated with the subjects' underestimation or overestimation of their coronary risk in comparison with the risk calculated using a reference chart. Results of multiple logistic regression analysis.

	OR (95% CI)	p
Variables associated with underestimation		
Diabetes	21.00 (4.74-93.04)	0.0001
Age ≥ 65 years	11.07 (6.76-18.11)	0.0001
Male sex	7.58 (4.60-12.49)	0.0001
Low educational level	3.20 (1.82-5.61)	0.0001
Variable associated with overestimation		
Antihypertensive treatment	2.20 (1.34-3.56)	0.0018

CI = confidence interval; OR = odds ratio.

of effective prevention. However, physicians and subjects may judge cardiovascular risk factors differently. For physicians, the perception of risk factors mostly derives from scientific models based on epidemiological studies; for most individuals, however, the perception of risk factors and beliefs about the reason for disease are influenced by personal experience, family, friends and local beliefs[16,17]. Bjerrum et al.[7] found that patients and general practitioners have quite different perceptions of the risk of IHD[7].

To our knowledge, little is known about how people assess their cardiovascular risk[6-9] or how such self-assessment compares with the indices of risk as defined in epidemiological studies[6]. The only two studies that included samples of the general population were performed several years ago in a different geographic and socio-cultural context with a high cardiovascular risk[6,9].

In our study, 56% of the recruited subjects judged themselves as being at low/mild risk, and only 9% as being at high/very high risk (Table I); comparing this with the level of risk calculated from the reference chart[10,11], 27% of them underestimated the risk and 40% overestimated it (Fig. 1). However, among the 260 subjects who overestimated their risk, 202 (77.6%) considered themselves as being at mild/moderate risk but were actually at low/mild risk; on the other hand, of the 51 persons at high or very high risk of coronary events only 3 were conscious of their risk; the others underestimated it, sometimes very steeply.

Among the risk factors considered, only four conditions were found to be independently associated with a higher risk perception: antihypertensive and lipid-lowering drug treatments, obesity or overweight, and cigarette smoking. Surprisingly, common and important coronary risk factors such as diabetes, older age and male sex were not considered specifically relevant, and cigarette smoking was assigned only borderline importance. Consequently, diabetics, males and older people tended to greatly underestimate their risk.

These findings are unexpected, particularly for known risk factors such as smoking and diabetes; however, the focus on renal, ocular and neurological com-

plications could have overshadowed the coronary consequences. Old age and male sex, which are not modifiable risk factors, nonetheless help raise the global risk in otherwise similar conditions. Marteau et al.[6] observed, in a large cohort, that people accorded greater importance to "visible" risk factors such as smoking, obesity and death of relatives from coronary heart disease and less importance to the "hidden" ones (such as cholesterol levels and BP) or to age and sex.

We evaluated the "objective" risk on the basis of the parameters included in the reference chart which considers age, sex, systolic BP and total cholesterol levels, a history of diabetes and cigarette smoking, but not a family history or body mass index[10,11]. In our population multiple regression analysis showed that obesity and overweight were independently associated with a higher risk perception but we did not include the family history in the questionnaire.

As expected, in our population a low educational level tended to lower the perception of the risk.

We wondered whether subjects who underestimated their risk were more negligent in terms of their health care than the rest of the population examined. The questionnaire therefore asked the time since the last medical visit and measurements of BP and cholesterol. Figure 2 suggests that the subjects at higher risk who underestimated their risk seemed just as diligent as the others.

The main limit of our study is the voluntary nature of the recruitment that could have biased the representativeness of the population. Nevertheless, our population seems to be representative of the general population with regard to the distribution of cardiovascular risk factors[13]; moreover there was a good distribution among the decades of age, with only a small prevalence of females. While possibly representing the "positive" tail of the distribution curve of care for cardiovascular prevention in the general population, subjects who participated in this study proved to have a poor knowledge of the meaning of major risk factors and one out of 4 had an often unjustified optimism in his assessment of the level of risk.

To assess the coronary risk of this population we chose as reference chart the only one available for the Italian population at the time of the survey. We preferred this chart, although it may not be the one most frequently used, as the chart used nationwide to target lipid-lowering therapy in patients at high absolute risk[18] is the one suggested by the Joint Task Force of European Societies on Coronary Prevention[5] which overestimates the risk in populations at low cardiovascular risk such as those in the Mediterranean area[19-21]. As expected, the use of the European chart would have led to a higher frequency of "underestimation" (40%) and a lower frequency of "overestimation" (29%) of the coronary risk level[22].

In conclusion, in our study a large percentage of persons who run a high coronary risk are unaware either of their risk or of the main causal factors. They consider themselves at risk when they are obese, smokers or need "pills" to treat hypertension or hypercholesterolemia. Nonetheless, they take care of themselves with frequent visits to their doctor and through the measurement of their BP and cholesterol levels. A weak link in the chain seems to be the relationship between patient and doctor. We believe that counseling about risk factors must start well before a drug prescription. Even though this may be time-consuming, general practitioners must be encouraged in this important task. They should be supported by campaigns aimed at arousing the public opinion to preventive opportunities involving the National Health Service, public education, scientific societies and the media. Proper perception of the risk of myocardial infarction or other cardiovascular diseases is a first step towards avoiding them.

Acknowledgments

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