Comparison of the REGICOR and SCORE Function Charts for Classifying Cardiovascular Risk and for Selecting Patients for Hypolipidemic or Antihypertensive Treatment

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Introduction and objectives. In Spain, use of the Framingham-REGICOR (Registre Gironí del Cor) and SCORE (Systematic Coronary Risk Evaluation) risk charts is recommended for stratifying cardiovascular disease risk. The aims of the present study were to evaluate the degree of agreement between these charts when used to evaluate cardiovascular disease risk in nondiabetic individuals aged 40-65 years and to estimate the percentage of patients recommended for hypolipidemic or antihypertensive treatment.

Methods. The study included 608 nondiabetic patients aged between 40-65 years (mean, 52.8 years, 56.7% female) with no evidence of cardiovascular disease who were attending a primary healthcare center between 1990-1994. REGICOR and SCORE risk functions were used to calculate 10-year cardiovascular disease risks. Patients were classified as high-risk if their risk was ≥10% with REGICOR or ≥5% with SCORE.

Results. Some 7.9% of the population was classified as high-risk with REGICOR and 9.2%, with SCORE (*P*=.41). Only 2.6% and 2.9% (*P*=.81) of women were classified as high-risk, compared with 14.8% and 17.5% of men, with REGICOR and SCORE, respectively (*P*=.40). The kappa coefficient was 0.45. According to European professional society guidelines, 23.8% of patients classified by SCORE and 23.0% classified by REGICOR (*P*=.73) would be recommended hypolipidemic treatment, while 31.2% and 31.7% (*P*=.85), respectively, would be recommended antihypertensive treatment.

Conclusions. There was moderately good agreement between REGICOR and SCORE charts when used to evaluate nondiabetic individuals aged 40-65 years. They identified similar percentages of patients who would be recommended for hypolipidemic or antihypertensive treatment.

Key words: *Cardiovascular risk. Coronary risk. SCORE risk chart. REGICOR risk chart.*

Comparación de las tablas REGICOR y SCORE para la clasificación del riesgo cardiovascular y la identificación de pacientes candidatos a tratamiento hipolipemiante o antihipertensivo

Introducción y objetivos. Las funciones de Framingham-REGICOR y SCORE son funciones recomendadas en la estratificación del riesgo cardiovascular en nuestro país. El objetivo del presente estudio fue evaluar la concordancia de estas tablas en la estratificación del riesgo en la población no diabética de 40-65 años y estimar el porcentaje de pacientes candidatos a recibir tratamiento hipolipemiante e hipotensor.

Métodos. Se incluyó a un total de 608 pacientes no diabéticos de 40-65 años de edad (media, 52,8 años; 56,7%, mujeres) sin evidencia de enfermedad cardiovascular, atendidos en el centro de salud durante los años 1990-1994. El riesgo cardiovascular a los 10 años se calculó mediante la ecuación de REGICOR y SCORE. Se consideró pacientes de riesgo alto a los que tenían un riesgo ≥ 10% en REGICOR y ≥ 5% en SCORE.

Resultados. Un 7,9% de la población fue catalogada de riesgo alto en REGICOR y un 9,2% en SCORE (p = 0,41). Solamente el 2,6 y el 2,9% de las mujeres (p = 0,81) se incluyeron en la categoría de riesgo alto, frente al 14,8 y 17,5% de los varones (p = 0,40) en REGICOR y SCORE, respectivamente. El coeficiente kappa fue 0,45. El seguimiento de las recomendaciones de las Sociedades Europeas implicaría que el 23,8% de los pacientes, según SCORE, y el 23,0%, según REGICOR (p = 0,73), serían candidatos a recibir tratamiento hipolipidemiante, y el 31,2 y el 31,7% (p = 0,85), a recibir fármacos antihipertensivos.

Conclusiones. Las tablas REGICOR y SCORE presentan una concordancia moderada en la población no diabética de 40-65 años de edad. Su aplicación identifica a un porcentaje similar de pacientes candidatos a recibir tratamiento hipolipemiante o antihipertensivo.

Palabras clave. *Riesgo cardiovascular. Riesgo coronario. Tablas de riesgo SCORE. Tablas de riesgo REGICOR.*

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ABREVIATIONS

CR: coronary risk
REGICOR: Registre Gironí del Cor
SBP/DBP: systolic blood pressure/diastolic blood pressure
SCORE: Systematic Coronary Risk Evaluation

INTRODUCTION

The most reasonable and cost effective way of setting priorities in cardiovascular prevention in asymptomatic patients is to estimate their cardiovascular risk. Such an approach will allow resources to be allocated according to needs as defined by the risk of cardiovascular disease.[1]

In recent decades, assessment of risk of coronary artery disease in North America and Europe has been based on the Framingham risk function.[2-4] However, this risk function overestimates the risk in some study populations.[5-8] Also, in Spain, the high scores on the cardiovascular risk charts based on the prevalence of risk factors are at odds with the observed rates of mortality due to ischemic heart disease.[9,10]

The investigators of the REGICOR (Registre Gironí del Cor) and Framingham studies followed the recommendations for calibration of the Framingham risk function[11,12] in the Spanish population and showed that its application in Spain is best applied in the setting of primary prevention of coronary heart disease.[13] Recently, the Systematic Coronary Risk Evaluation (SCORE) charts have been published.[14] These estimate the risk of cardiovascular death and are currently the charts recommended by the European societies[15] and the Spanish Interdisciplinary Committee for Cardiovascular Disease Prevention (CEIPC).[16]

Comparison of the SCORE charts[14] with the Framingham risk function in the Spanish population yields contradictory results and notable differences in the profile of high-risk patients,[17-20] with twice as many patients at high risk according to the SCORE approach,[19] 3 times as many elderly men who are candidates for aggressive preventative therapy,[17] and no lipid-lowering therapy in a substantial percentage of patients at high risk according to the Framingham risk function.[18] After the comparison of the REGICOR chart and Framingham risk function made by Wilson et al,[21] it was concluded that coronary risk was overestimated in the latter case and that a greater percentage were candidates for lipid-lowering therapy.[22] Finally, a comparative study of the REGICOR risk function[12] and the SCORE chart[14] revealed a good correlation between these and the Framingham equation and a similar percentage of patients who were candidates for lipid-lowering therapy.[23]

The aim of this study was to compare and analyze the agreement between the Framingham-REGICOR risk function and the SCORE charts in the nondiabetic population aged between 40 and 65 years old who attended a health care center. In addition, the study aimed to assess the repercussions of applying both functions to detecting potential candidates for lipid-lowering therapy or antihypertensive treatment.

METHODS

The health care center La Paz de Badajoz, Spain, caters to a population of approximately 27 650 inhabitants (53.8% women), who are mainly middle class.

A descriptive cross-sectional study was performed. We included all patients whose age was covered by both risk risk function (40-65 years), who had no history of diabetes, ischemic heart disease, or other cardiovascular diseases, and whose medical history was recorded between January 1, 1990 and December 31, 1994 and included the information necessary to calculate the coronary risk (CR) according to the Framingham-REGICOR risk function[12] and the risk of cardiovascular disease according to the SCORE charts.[14] The required variables are age, sex, systolic blood pressure (SBP) and diastolic blood pressure (DBP), total cholesterol, high-density lipoprotein cholesterol (HDL-C), and smoking habit. In total, 608 patients were included (12% of the population within this age range). At the time of inclusion, the following variables were also collected: body mass index, triglycerides, low-density lipoprotein cholesterol (LDL-C), and use of lipid-lowering and antihypertensive agents. Patients diagnosed with diabetes were excluded on the grounds that the SCORE function considers them as high cardiovascular risk.[14]

Patient Stratification According to Risk

The original REGICOR and SCORE risk function were used to calculate risk. Patients with high CR were defined as those with a score of 10% or more according to the Framingham-REGICOR functions. Patients were considered to have high cardiovascular risk if they had a risk of 5% or more according to the SCORE charts. Moderate risk was taken to be 5% to 9.9% according to the REGICOR function and 3% to 4.9% according to the SCORE charts. Low risk was defined as scores of less than 5% according to the REGICOR functions and less than 3% according to the SCORE charts.

The threshold was set to 10% or greater for a high CR in the Framingham-REGICOR risk function[12] because there are no guidelines to indicate what risk score should require preventative intervention. Therefore, simply using the 20% threshold of the Framingham risk function might not be appropriate.[24] On the other hand, another recent study[23] has shown that the REGICOR function, with a cut-off point of 10% or greater, stratifies a similar number of patients as high risk as the SCORE charts.

TABLE 1. **General Characteristics of the Study Population***

	Total (n=608)	Men (n=263)	Women (n=345)	*P*
Age, y	52.8 (7.4)	50.9 (7.6)	54.2 (6.9)	<.001
SBP, mm Hg	137.9 (20.1)	136.2 (19.4)	139.2 (20.5)	.074
DBP, mm Hg	85.1 (11.2)	85.3 (11.9)	85.0 (10.6)	.643
Arterial hypertension†	455 (74.8%)	191 (72.6%)	264 (76.5%)	.272
Total cholesterol, mg/dL	246 (41)	244 (42)	247 (41)	.377
HDL-C, mg/dL	52 (15)	46 (13)	57 (15)	<.001
LDL-C, mg/dL	168 (39)	169 (40)	167 (38)	.775
Triglycerides, mg/dL	131 (75)	155 (86)	112 (58)	<.001
Total cholesterol ≥240 mg/dL	226 (37.2%)	91 (34.6%)	135 (39.1%)	.252
Total cholesterol ≥280 mg/dL	109 (17.9%)	48 (18.3%)	61 (17.7%)	.856
BMI	28.1 (4.3)	27.9 (3.6)	28.3 (4.7)	.669
Smokers	169 (27.8%)	126 (47.9%)	43 (12.5%)	<.001
Antihypertensive agents	180 (29.6%)	73 (27.8%)	107 (31.0%)	.383
Lipid-lowering treatment	112 (18.4%)	48 (18.3%)	64 (18.6%)	.925

*Values expressed as mean (SD) or number (percentage). HDL-C indicates high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure.
†Arterial hypertension was defined as SBP ≥140 mm Hg and/or DBP ≥90 mm Hg.

To estimate the percentage of patients who are candidates for pharmacotherapy (antihypertensive or lipid-lowering therapy), the original recommendations of the European societies were applied[15] and their Spanish translations and adaptations.[25] In summary, patients with SBP of 180 mm Hg or more or DPB of 110 mm Hg or more are candidates to receive antihypertensive pharmacotherapy, regardless of their cardiovascular risk. Likewise, patients with SBP of 140 mm Hg or more or DBP of 90 mm Hg or more and a SCORE risk of 5% or more or a REGICOR score of 10% or more are also candidates for antihypertensive pharmacotherapy. With regard to the lipid profile, candidates for pharmacotherapy are those with a SCORE risk of 5% or more or a REGICOR score of 10% or more and total cholesterol levels of 200 mg/dL or more and/or LDL-C of 130 mg/dL or more. When calculating the risk, is was assumed, as is common practice,[18-20,22] that those who were already receiving antihypertensive or lipid-lowering treatment were receiving appropriate drugs at appropriate doses. However, these calculations were also done after excluding patients on lipid-lowering therapy or antihypertensive treatment in order to avoid bias and allow comparisons of results.

Statistical Analysis

The SPSS 11.5 statistical package for Windows and the Epi Info program version 6.04 were used for data processing and analysis. The statistical analysis used different descriptive parameters such as mean, SD, and calculation of ratios. The normality of the numerical variables was analyzed using the Kolmogorov-Smirnov tests and the homoscedasticity test. In the bivariate analysis, the χ^2 test and ANOVA (F) or their equivalent nonparametric tests for nonnormally distributed data (Mann-Whitney U test) were used.

Analysis of the agreement between the different risk function for calculating CR was done using the κ statistic, with values of 0.81-1 considered as an "excellent" agreement, 0.61-0.80 as "good," and 0.41-0.60 as "moderate."

A *P*-value less than .05 was considered significant.

RESULTS

As shown in the general characteristics of the study population presented in Table 1, the mean age was 52.8 years, the mean body mass index (BMI) was 28.1, and 74.8% of the patients had hypertension, 37.2% had total cholesterol above 240 mg/dL, and 27.8% were smokers.

The mean risk was 4.9% calculated according to REGICOR risk function and 2.1% according to the SCORE charts, with a greater risk in men. The percentage of patients considered high risk was 7.9% according to REGICOR and 9.2% according to SCORE (*P*=.41) (Table 2).

The proportions of subjects included in the low, moderate, and high-risk categories were 60.5%, 31.6%, and 7.9%, respectively, according to REGICOR and 79.6%, 11.2%, and 9.2%, respectively, according to the SCORE charts (Figure 1). Only 2.6% of women according to REGICOR and 2.9% according to SCORE were classed as high risk (*P*=.81), compared to 14.8% and 17.5% of men, respectively (*P*=.40) (Figure 2). In the subgroup of patients aged 60 to 64 years, 57.5% and 17.5% of the men were classed as high risk according to the SCORE

TABLE 2. **Mean Risk and Percentage of High Risk Patients According to the REGICOR Equation and SCORE Chart***

	Total (n=608)	Men (n=263)	Women (n=345)	*P*
REGICOR risk	4.9 (3.3)	6.2 (4.0)	4.0 (2.5)	<.001
SCORE risk	2.1 (2.5)	3.0 (3.2)	1.4 (1.6)	<.001
High-risk population according to REGICOR	48 (7.9%)†	39 (14.8%)	9 (2.6%)	<.001
High-risk population according to SCORE	56 (9.2%)	46 (17.5%)	10 (2.9%)	<.001

*Values expressed as mean (SD) or number (percentage).
†*P*=.412 for comparison of percentage of high-risk population according to REGICOR (7.9%) and SCORE (9.2%).

charts and the REGICOR equation, respectively (*P*=.07), whereas the corresponding percentages for women were 7.1% and 6.0%, respectively (*P*=.75).

Comparison between patients considered high risk according to REGICOR and those considered high risk according to SCORE (Table 3) shows that more than 80% were men (*P*<.001). Moreover, they tended to be older (60.5 vs 58.3 years; *P*<.05) with higher HDL-C levels (47 vs 37 mg/dL; *P*<.001) in those classed as high risk according to SCORE and have higher triglyceride concentrations (192 vs 156 mg/dL; *P*<.05) in high-risk patients according to REGICOR. The mean risk of cardiovascular death was high (mean SCORE score, 6.4%) in patients with high CR according to REGICOR (Table 3). Patients considered at high risk of cardiovascular death according to SCORE also had a high CR (mean REGICOR score, 11.0%).

The κ statistic for agreement between the two equations for classifying high-risk patients was 0.45.

The distribution of patients as high risk according to one of the equations is shown in Figure 3, with only a 33% agreement. The analysis of disagreements, that is, patients with a high risk according to one function and a low risk according to the other (Table 4) shows that patients with high REGICOR risk and low SCORE risk all had hypertension, were younger (55.5 vs 60.3 years; *P*<.01), had lower HDL-C levels (33 vs 52 mg/dL; *P*<.01), received less antihypertensive therapy (27.3% vs 56.7%; *P*<.05), and a higher percentage were smokers (40.9% vs 0%; *P*<.001) than high-risk patients according to SCORE who were low risk according to REGICOR.

The profile of high-risk patients according to both functions was one of predominantly male (84.6%), hypertensive (96.2%), smokers (76.9%), with mean cholesterol levels of 267 mg/dL, and mean triglyceride levels of 199 mg/dL. Of these patients, 50% were receiving antihypertensive therapy and 42.3% lipid-lowering drugs.

In the stratification of risk in the different categories of the risk factors of the patients (Table 5), smokers had a higher overall risk according to both equations (mean risk of 6.8% in REGICOR and 3.1% in SCORE). Nevertheless, when a separate analysis was done by sex

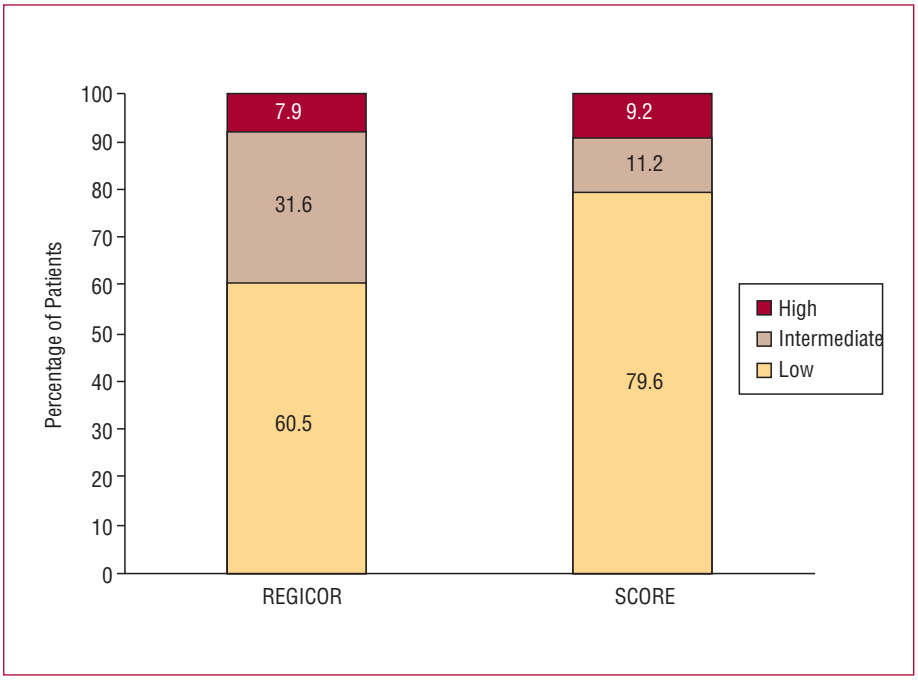

Figure 1. Population distribution according to risk categories and the REGICOR and SCORE equations

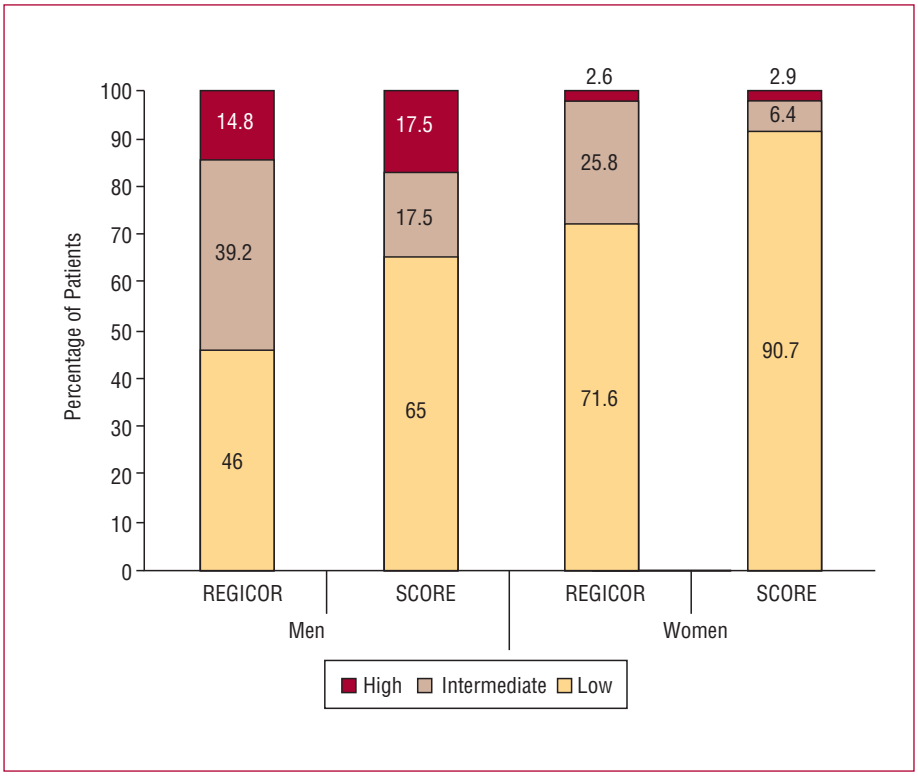

Figure 2. Population distribution according to risk categories and sex in the REGICOR and SCORE equations.

(Table 5), obese men were found to have the highest mean risk, both according to REGICOR (8.3%) and SCORE (4.3%). The females at highest risk were smokers according to REGICOR (mean risk, 4.8%) and those with cholesterol levels above 250 mg/dL according to SCORE (mean risk, 1.7%).

According to the practical recommendations of the SCORE guidelines,[16,25] 23.8% of the patients would be candidates to receive lipid-lowering drugs and 23.0%

TABLE 3. **Profile of Patients Classed as High Risk in the Framingham-REGICOR Equation and SCORE Charts***

	High Risk According to REGICOR (n=48)	High Risk According to SCORE (n=56)	*P*
Age, y	58.3 (5.0)	60.5 (4.1)	<.05
SBP, mm Hg	151.1 (18.7)	158.4 (22.2)	.07
DBP, mm Hg	89.2 (9.3)	90.7 (11.6)	.473
Grade II-III hypertension†	21 (43.8%)	33 (58.9%)	.122
Arterial hypertension‡	47 (97.9%)	52 (92.9%)	.457
Total cholesterol, mg/dL	263 (46)	261 (56)	.844
HDL-C, mg/dL	37 (9)	47 (12)	<.001
LDL-C, mg/dL	196 (48)	186 (56)	.334
Triglycerides, mg/dL	192 (95)	156 (81)	<.05
BMI	28.7 (3.5)	27.9 (3.9)	.276
Smokers	29 (60.4%)	39 (69.6%)	.324
Antihypertensive therapy	19 (39.6%)	30 (53.6%)	.154
Lipid-lowering therapy	17 (35.4%)	18 (32.1%)	.724
Mean risk according to SCORE	6.4 (4.1)	8.5 (3.1)	.887
Mean risk according to REGICOR	13.0 (0.3)	11.0 (0.4)	.776
Males	39 (81.2%)	46 (82.1%)	.906
Females	9 (18.8%)	10 (17.9%)	.906

*Values are expressed as mean (SD) or number (percentage). HDL-C indicates high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure.
†Grade II-III arterial hypertension: DBP≥160 mm Hg and/or SBP≥100 mm Hg.
‡Arterial hypertension: SBP≥140 mm Hg and/or DBP≥90 mm Hg.

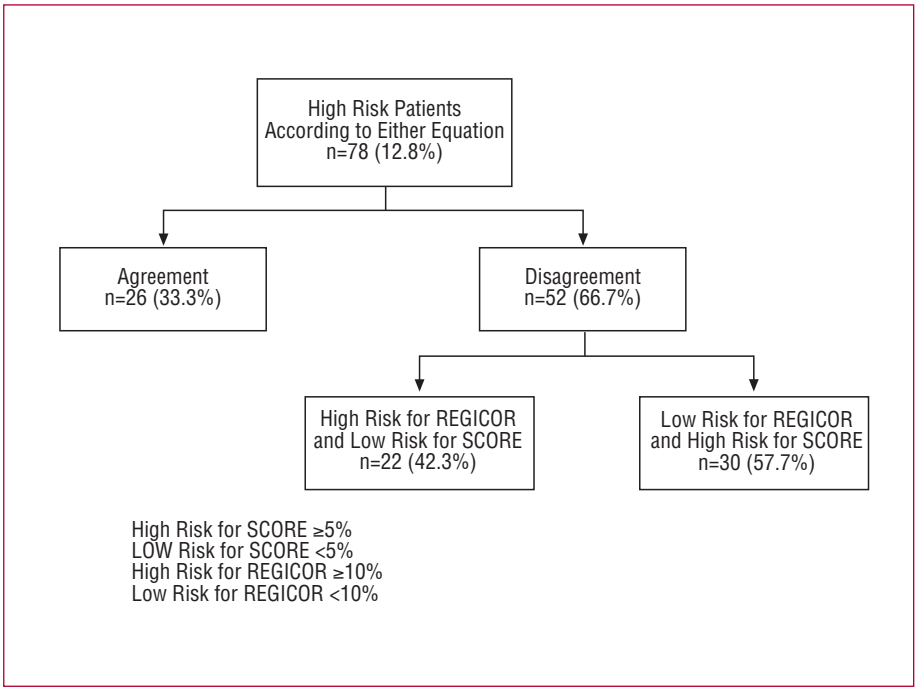

Figure 3. Distribution of high-risk patients.

would be candidates to receive antihypertensive therapy, whereas according to REGICOR, those percentages would be 31.2% and 31.7%, respectively (*P*=.85) (Table 6). In those aged 60 to 64 years, 36.3% compared to 32.2% (*P*=.50) would be candidates to receive lipid-lowering drugs according to SCORE, whereas according to REGICOR, those figures would be 49.2% versus 46.8% (*P*=.70), respectively (Table 7).

After excluding patients who took lipid-lowering or antihypertensive therapy, no differences were found in the percentage of patients prescribed lipid-lowering therapy between SCORE and REGICOR, either in the population aged 40 to 65 years (6.6% vs 5.6%; *P*=.50) or in the subgroup aged 60 to 64 years (42.4% vs 37.7%; *P*=.48). Likewise, there were no significant differences in the percentage of candidates to receive antihypertensive drugs with SCORE and REGICOR, either in the population aged 40 to 65 years (2.3% vs 3.0%; *P*=.52) or in the 60 to 64 year-old age group (85.3% vs 89.7%; *P*=.43). However, the percentage indication of lipid-

TABLA 4. **Profile of Patients With Disagreement Between the REGICOR and SCORE Equations***

	High REGICOR-Low SCORE (n=22)	Low REGICOR-High SCORE (n=30)	*P*
Age, y	55.5 (5.4)	60.3 (4.8)	<.01
SBP, mm Hg	144.1 (12.7)	159.6 (23.5)	.08
DBP, mm Hg	87.9 (8.9)	91.0 (13.3)	.347
Arterial hypertension†	22 (100%)	23 (76.7%)	<.05
Total cholesterol, mg/dL	258 (54)	257 (67)	.954
HDL-C, mg/dL	33 (7)	52 (11)	<.01
LDL-C, mg/dL	200 (58)	181 (66)	.285
Triglycerides, mg/dL	184 (102)	118 (44)	.103
BMI	29.3 (3.9)	27.6 (4.5)	.160
Smokers	9 (40.9%)	0	<.001
Antihypertensive treatment	6 (27.3%)	17 (56.7%)	<.05
Lipid-lowering treatment	6 (27.3%)	7 (23.3%)	.745
Mean risk according to SCORE	3.1 (1.1)	7.8 (2.6)	.781
Mean risk according to REGICOR	11.5 (1.2)	7.9 (1.7)	.714
Males	17 (77.3%)	24 (80.0%)	.915
Females	5 (22.7%)	6 (20.0%)	.915

*Values are expressed as mean (SD) or number (percentage). HDL-C indicates high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure.
†Arterial hypertension: SBP≥140 mm Hg and/or DBP≥90 mm Hg.

TABLE 5. **Mean Risk in Patients According to Different Categories of Risk Factor**

	SCORE			REGICOR		
	Men	Women	Total	Men	Women	Total
Hypertensive*	3.6%	1.6%	2.4%	7.2%	4.6%	5.7%
Nonhypertensive	1.4%	0.6%	1.0%	3.7%	2.3%	2.9%
Smokers	3.7%	1.4%	3.1%	7.5%	4.8%	6.8%
Nonsmokers	2.3%	1.3%	1.7%	5.1%	3.9%	4.3%
Obese†	4.3%	1.6%	2.6%	8.3%	4.6%	6.0%
Nonobese	2.7%	1.3%	1.9%	5.8%	3.8%	4.7%
Cholesterol ≥200 mg/dL	3.1%	1.4%	2.1%	6.4%	4.2%	5.1%
Cholesterol <200 mg/dL	2.6%	0.7%	1.7%	5.1%	2.8%	3.9%
Cholesterol ≥250 mg/dL	3.5%	1.7%	2.5%	7.4%	4.6%	5.7%
Cholesterol <250 mg/dL	2.6%	1.0%	1.7%	5.4%	3.6%	4.4%

*Arterial hypertension is defined as systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg.
†Obesity is defined as body mass index ≥30.

lowering and antihypertensive therapy was significantly greater in men than in women in the population aged 40 to 65 years with the two risk equations: 12.6% versus 2.1% (P<.001) and 10.7% versus 1.8% (P<.01) for lipid-lowering therapy according to SCORE and REGICOR, respectively, and 5.1% versus 0.7% (P<.01) and 5.8% versus 1.5% (P<.05) for antihypertensive therapy according to SCORE and REGICOR, respectively. In the subgroup aged 60 to 64 years old, lipid-lowering treatment would have been greater in men than in women (63.2% vs 30.9%; P<.01, and 52.6% vs 29.4%; P<05, according to SCORE and REGICOR, respectively), whereas the percentage prescription of antihypertensive therapy was greater in women than in men (95.4% vs 66.7%; P<.01, and 97.7% vs 75.0%; P<.05, according to SCORE and REGICOR, respectively).

TABLE 6. **Patients in the Overall Population Who Were Candidates for Pharmacotherapy (Lipid-lowering or Antihypertensive Agents) According to Recommendations Made in the SCORE Guidelines and on Assessing the SCORE and REGICOR Risk Functions**

	With SCORE	With REGICOR	*P*
Lipid-lowering Treatment			
Men	75 (28.5%)	71 (27.0%)	.696
Women	70 (20.3%)	69 (20.0%)	.924
Total	145 (23.8%)	140 (23.0%)	.734
Antihypertensive Treatment			
Men	81 (30.8%)	82 (31.2%	.924
Women	109 (31.6%)	111 (32.2%)	.87
Total	190 (31.2%)	193 (31.7%)	.853

TABLE 7. **Patients Aged 60 to 64 Years Who Were Candidates for Pharmacotherapy (Lipid-lowering or Antihypertensive Agents) According to Recommendations Made in the SCORE Guidelines and on Assessing the SCORE and REGICOR Risk**

	With SCORE	With REGICOR	*P*
Lipid-lowering Treatment			
Men	24 (60.0%)	20 (50.0%)	.368
Women	21 (25.0%)	20 (23.8%)	.857
Total	45 (36.3%)	40 (32.3%)	.503
Antihypertensive Treatment			
Men	16 (40.0%)	18 (45.0%)	.651
Women	42 (50.0%)	43 (51.2%)	.877
Total	58 (46.8%)	61 (49.2%)	.702

DISCUSSION

The European societies include the calculation of the risk of cardiovascular death (SCORE risk charts) in their most recent guidelines in replacement of CR of the Framingham risk function.[15] The Spanish program of Preventative Activities and Health Promotion (PAPPS) also prefers using the SCORE chart for risk calculation and establishing priorities in cardiovascular prevention,[27] signing the consensus document drawn up by the CEIPC.[16] The rationale of the CEIPC for preferring SCORE is that this method is better adapted to the Spanish population. But at present, other methods are also available for calculating risk, including the calibrated CR Framingham risk function (REGICOR)[12] that have been adapted to the Spanish population (DORICA),[28] and the adaption of the Framingham equation to patients with hypertension and hypercholesterolemia.[29] Furthermore, studies have been reported that question the use of SCORE because it increases the prescription of lipid-lowering drugs compared to charts derived from the Framingham risk function in our population.[17,18]

Our results show moderate agreement between the Framingham-REGICOR equation[12] and the SCORE[14] risk chart. It is understandable that the agreement is not better because these charts predict different

cardiovascular events and have been set up with different cohorts of the Spanish population. The percentage of patients classed as high risk was 7.9% for REGICOR and 9.2% for SCORE (*P*=.41). The characteristics of high-risk patients are very similar, although their age is somewhat higher according to SCORE, more are smokers, and the lipid profile is better (Table 3). Classification of patients as high risk according to one of the methods was in disagreement in 66.7% of the patients (Figure 3). Most of these (57.7%) corresponded to the low-risk group according to REGICOR and the high-risk group according to SCORE, and 42.3% corresponded to the high-risk group according to REGICOR and the low-risk one according to SCORE. Application of the recommendations made by the European societies would allow this new high-risk group to be captured by the SCORE chart (mean risk, 7.8%) and nonhigh-risk group of REGICOR (mean risk, 7.9%), made up on average of 60.3 year-old nonsmoking men with hypertension and HDL-C levels of 52 mg/dL and LDL-C levels of 181 mg/dL (Table 4). On the other hand, application of SCORE would no longer consider patients with the following characteristics as high risk: men (77.3%), mean age 55.5 years, hypertensive patients (100%), elevated LDL-C (200 mg/dL), low HDL-C (33 mg/dL), and smokers (40.9%). Comparison of these two discordant groups shows that the REGICOR chart gives more weight to smoking and low HDL-C levels, whereas SCORE (which does not include HDL-C) places more emphasis on high blood pressure, in agreement with the CR and cardiovascular risk which are estimated by both charts.

Most women were classed as low risk according to both functions (90.7% of women in SCORE and 71.6% in REGICOR), whereas the percentages of high-risk women were similar: 2.9% in SCORE and 2.6% in REGICOR, figures that are comparable to those reported by Mostaza et al.[17]

The therapeutic guidelines of the SCORE project[15,25] were used to calculate the percentage of subjects indicated for pharmacotherapy. In the overall sample, including patients with lipid-lowering and antihypertensive therapy, 23.8% of the population were candidates to receive lipid-lowering drugs and 31.2% to receive antihypertensives, according to the recommendations of the European societies,[25] compared to 23.0% and 31.7%, respectively, according to the REGICOR chart (Table 6). Exclusion of patients who had received treatment with lipid-lowering drugs or antihypertensives reduced the percentage of patients indicated for lipid-lowering drugs to 6.6% according to SCORE and 5.6% according to REGICOR and the percentage of those indicated for antihypertensive therapy to 2.3% and 3.0%, respectively.

In the older population (60-64 years), choosing the SCORE function would identify 36.3% of the patients as candidates to receive lipid-lowering drugs compared to 32.3% according to REGICOR, due above all to greater prescription among men (Table 7). After excluding patients treated with lipid-lowering or antihypertensive agents, the SCORE function also identified a higher percentage of patients as candidates to receive lipid-lowering treatment in this subgroup (42.4%) than the REGICOR risk function (37.7%), although the differences were not statistically significant (*P*=.48).

Our study has its limitations. It includes data from a population cohort attended in a health care center between 1990 and 1994. This population was not randomly selected, but corresponded to patients who had attended the center and had a clinical history that included the information necessary for calculating the cardiovascular risk according to the two risk charts. The period when data collection started coincided with the first years of health care reform and the setting up of health care centers. Most of the patients assigned to these centers did not have a proper clinical history. The recording of clinical histories by health care professionals is progressive. Their daily number varied according to the structural factors of the centers (excessive demand, bureaucratic overload, home visits, etc) and unrecorded criteria. Nevertheless, these clinical histories were generally recorded by professionals according to the chief complaint and the risk profile of each patient. This may explain the higher prevalence of mean values for risk factors in our population compared to other study populations.[30-32]

These aspects do not interfere with the comparability of the two risk function, but the type of patient selection does limit the external validity of the study. The inclusion of patients receiving lipid-lowering or antihypertensive agents also implied a biased overall risk in the cohort compared to untreated patients and may limit the internal validity, but this does not invalidate comparison of the 2 risk charts as all patients' scores were calculated simultaneously.

CONCLUSIONS

Our study shows a moderate agreement between the REGICOR and SCORE risk charts and a prescription of lipid-lowering and antihypertensive drugs that did not differ significantly after assessing the risk according to both risk function, both in the overall population (*P*=.73 and *P*=.85) and after excluding patients with prior lipid-lowering or antihypertensive therapy (*P*=.50 and *P*=.52). Likewise, no significant differences were found in the percentages of patients with such drug prescriptions in the 60 to 64 year-old subgroup. Nevertheless, the small differences found could correspond to a high cost, both because of the cost of the drugs themselves and the extent of use. Other aspects of these risk charts, such as their ability to predict cardiovascular events, may tip the lead towards choosing one of them in the management of cardiovascular risk in Spain.

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