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ORIGINAL

Cardiovascular risk stratification using the globorisk scale in the population of the Czech Republic

Estratificación del riesgo cardiovascular empleando la escala globorisk en población de la República Checa

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Abstract

Introduction: The risk of cardiovascular disease can be determined with a multitude of scales. The present study aims to determine the level of cardiovascular risk in population of the Czech Republic by applying the Globorisk scale.
Methods: A descriptive, cross-sectional study of 28234 persons aged 40-74 years in whom cardiovascular risk was assessed using the Globorisk scale adapted to the population of the Czech Republic. The influence of sociodemographic variables (age, sex and social class) and tobacco consumption on the values of this scale was assessed.
Results: Both the mean values and the prevalence of high values of the Globorisk scale are higher in males, in older people, in people with lower socioeconomic status and in smokers. The variable that most influences the occurrence of high values of the scale is male sex with an odds ratio of 39.71 (95% CI 29.79-52.92).
Conclusions: All the sociodemographic variables analyzed, as well as tobacco consumption, influence the values of the Globorisk scale.

Keywords: Globorisk, cardiovascular disease, social class.

Resumen

Introducción: El riesgo de padecer enfermedades cardiovasculares se puede determinar con multitud de escalas. El presente estudio pretende determinar el nivel de riesgo cardiovascular en población de la República Checa aplicando la escala Globorisk.
Material y métodos: Estudio descriptivo y transversal en 28234 personas de edades comprendidas entre los 40 y 74 años en los que se valora el riesgo cardiovascular aplicando la escala Globorisk adaptada a la población de la República Checa. Se valora la influencia de variables sociodemográficas (edad, sexo y clase social) y consumo de tabaco en los valores de esta escala.
Resultados: Tanto los valores medios como la prevalencia de valores elevados de la escala Globorisk son más elevados en los varones, en las personas de mayor edad, en las personas con menor nivel socioeconómico y en los fumadores. La variable que más influye en la aparición de valores altos de la escala es el sexo masculino con una odds ratio de 39,71 (IC 95% 29,79-52,92).
Conclusiones: Todas las variables sociodemográficas analizadas, así como el consumo de tabaco influyen en los valores de la escala Globorisk.

Palabras clave: Globorisk, enfermedad cardiovascular, clase social.

Introduction

Cardiovascular disease (CVD) is defined as disease associated with ischemic vascular disorders, with symptomatic development of ischemic heart disease or coronary artery disease (acute myocardial infarction, stable or unstable angina), stroke (ictus) or peripheral vascular disease (peripheral arterial disease[1].

Cardiovascular risk (CVR) is the probability that an individual will develop a cardiovascular disease (angina, AMI, stroke, heart failure or peripheral vascular disease) in the next 10 years. It is calculated according to the number of risk factors present in the individual (qualitative risk) or taking into account the magnitude of each of them (quantitative risk). The determination of the GCR is used to: –Classify individuals and populations according to high, medium, low risk.– Determine the frequency of each factor individually. –Establish prevention strategies, according to risk levels and available resources.– Evaluate the impact of the preventive actions implemented in order to plan new measures[2].

Many scales exist to assess CVR, from the classic Framingham scales[3,4] with their corresponding adaptations to different countries[5] to other models that assess the probability of death, such as the SCORE scale[6]. In recent years, new scales have appeared, such as Globorisk[7], which present different models for each country.

In the Globorisk study, data from multiple cohorts were combined, which also allowed the inclusion of interaction terms between age or sex and risk factors. In addition, the risk score was used to estimate the 10-year risk of fatal cardiovascular disease using national health examination surveys from different countries around the world, including the Czech Republic[7].

The aim of this study is to determine how CVR is stratified by applying the Globorisk model in the population of the Czech Republic.

Methods

A descriptive, cross-sectional study was carried out in 29,168 persons in the Czech Republic, of whom 934 were eliminated for different reasons, 69 for not wishing to participate and 865 for not having all the data necessary to calculate CVR with the Globorisk model. The final number of persons included in the study was 28,234 (11,181 women and 17,053 men). See Flow chart in **figure 1**.

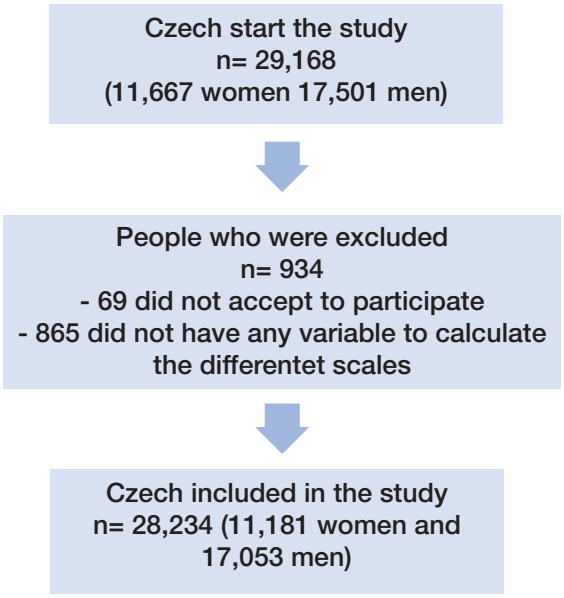
Inclusion criteria were as follows:

- Acceptance to participate in the study.
- Age between 40 and 74 years (as established by Globorisk).

Anthropometric height and weight measurements, both clinical and analytical, are performed by healthcare personnel after standardizing the measurement techniques.

Height and weight are determined with a SECA 700 scale with an attached SECA 220 telescopic measuring rod. Abdominal waist circumference is measured with an approved tape measure. Blood pressure is measured in the supine position with a calibrated OMRON M3 automatic sphygmomanometer after a 10-minute rest. Three measurements were taken at one-minute intervals and the mean of the three was obtained.

Figure 1: Flow chart of the study participants.



The analytical parameters are obtained by peripheral venipuncture after a 12-hour fast. Automated enzymatic methods are used for glycemia, total cholesterol and triglycerides. Values are expressed in mg/dl. HDL is determined by precipitation with dextran sulfate Cl2Mg, and values are expressed in mg/dl. LDL is calculated using the Friedewald formula (provided that triglycerides are less than 400 mg/dl). Values are expressed in mg/dl.

A person is considered to be a smoker if he/she has regularly consumed at least 1 cigarette/day (or the equivalent in other types of consumption) in the last month, or has stopped smoking less than one year ago.

The social class is determined from the 2011 National Classification of Occupations (CNO-11), based on the proposal of the group of social determinants of the Spanish Society of Epidemiology8. It is classified into 3 categories: Class I. Directors/managers, university professionals, athletes and artists. Class II. Intermediate occupations and self-employed workers without employees. Class III. Unskilled workers.

To determine the CVR with the Globorisk model, the table adapted to the population of the Czech Republic[9] was used.

Statistical analysis

A descriptive analysis of the categorical variables was performed, calculating the frequency and distribution of responses for each variable. For quantitative variables, the mean and standard deviation are calculated, and for qualitative variables the percentage is calculated. The bivariate association analysis was performed using the 2 test (with correction of Fisher's exact statistic when conditions required it) and Student's t test for independent samples. For the multivariate analysis, binary logistic regression was used with the Wald method, with calculation of the Odds ratio and the Hosmer-Lemeshow goodness-of-fit test. Statistical analysis was performed with the SPSS 27.0 program, with an accepted statistical significance level of 0.05.

Ethical considerations and aspects

The study was approved by the Clinical Research Ethics Committee. All procedures were performed in accordance with the ethical standards of the institutional research committee and with the 2013 Declaration of Helsinki. All patients signed written informed consent documents before participating in the study.

Of the sample, 60.4% were male. The mean age of the participants was about 49 years. The values of both anthropometric and clinical or analytical parameters are more unfavorable in males. The majority of people of both sexes are between 40 and 49 years of age. The percentage of smokers is slightly more than 32% in both sexes. All the characteristics of the sample can be consulted in **table I**.

Table II shows how the values of the Globorisk scale increase as the age of the person increases and as one descends in social class; this situation is seen in both men and women. Tobacco consumption also increases the risk in both sexes. All the data can be consulted in **table II**.

The prevalence of high values (≥ 10) increases with age in both sexes. An elevation of these values is also seen as one moves down in social class. Tobacco use also increases the percentage of people at high risk. The complete data are presented in **table III**.

Table I: Characteristics of the Czech Republic population.

	Men n=17,053	Women n=11,181	
	Mean (SD)	Mean (SD)	p-value
Age (years)	49.1 (6.4)	48.6 (6.3)	<0.0001
Height (cm)	173.5 (6.9)	160.7 (6.4)	<0.0001
Weight (kg)	83.1 (14.4)	67.6 (13.3)	<0.0001
Body mass index (kg/m²)	27.6 (4.4)	26.2 (4.9)	<0.0001
Waist circumference (cm)	87.1 (10.9)	75.2 (10.5)	<0.0001
Waist to height ratio	0.50 (0.06)	0.47 (0.06)	<0.0001
Systolic blood pressure (mmHg)	131.3 (16.4)	121.9 (16.9)	<0.0001
Diastolic blood pressure (mmHg)	81.1 (10.6)	75.3 (10.8)	<0.0001
Total cholesterol (mg/dl)	203.6 (37.1)	203.89 (35.3)	0.534
HDL-cholesterol (mmHg)	48.4 (8.4)	55.5 (8.9)	<0.0001
LDL-cholesterol (mmHg)	128.7 (35.3)	129.0 (34.0)	0.473
Triglycerides (mmHg)	136.2 (90.2)	97.4 (53.6)	<0.0001
Glycaemia (mmHg)	97.5 (23.8)	90.6 (17.3)	<0.0001
ALT (U/L)	31.8 (18.8)	21.7 (14.9)	<0.0001
AST (U/L)	24.7 (11.8)	18.7 (7.5)	<0.0001
GGT (U/L)	41.8 (46.5)	23.3 (22.2)	<0.0001
Creatinine (mg/dl)	0.93 (0.17)	0.75 (0.17)	<0.0001
	n (%)	n (%)	p-value
40-49 years	9557 (56.0)	6637 (59.3)	<0.0001
50-59 years	6221 (36.5)	3831 (34.3)	
60-79 years	1275 (7.5)	713 (6.4)	
Social class I	870 (5.1)	656 (5.9)	<0.0001
Social class II	2852 (16.7)	2619 (23.4)	
Social class III	13331 (78.2)	7906 (70.7)	
Non-smokers	11487 (67.4)	7522 (67.3)	0.445
Smokers	5566 (32.6)	3659 (32.7)	

Table II: Mean values of the Globorisk scale according age, social class and tobacco consumption by sex.

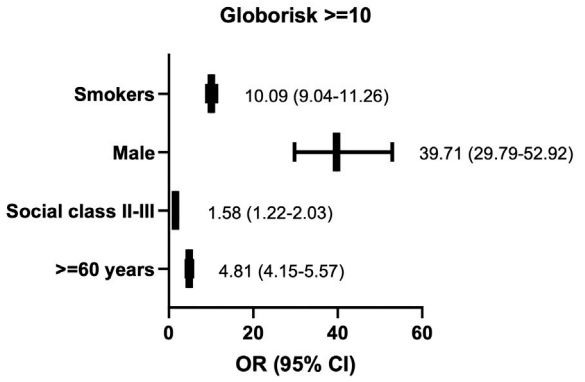
	Women			Men		
	n	Mean (SD)	p-value	n	Mean (SD)	p-value
40-49 years	6637	1.5 (1.1)	<0.0001	9557	4.1 (2.5)	<0.0001
50-59 years	3831	2.7 (1.7)		6221	7.4 (3.3)	
60-79 years	713	4.1 (2.0)		1275	8.4 (3.0)	
Social class I	656	1.8 (1.4)	<0.0001	870	5.0 (3.1)	<0.0001
Social class II	2619	1.9 (1.5)		2852	5.4 (3.1)	
Social class III	7906	2.2 (1.6)		13331	5.7 (3.4)	
Non-smokers	7522	1.5 (0.9)	<0.0001	11487	4.5 (2.5)	<0.0001
Smokers	3659	3.4 (1.9)		5566	8.0 (3.6)	

Table III: Prevalence of different values of the Globorisk scale according age, social class and tobacco consumption by sex.

		<5	5-9	≥ 10	
Women	n	% (95% CI)	% (95% CI)	% (95% CI)	p-value
40-49 years	6637	62.8 (62.1-63.5)	19.0 (18.3-19.7)	0.0 (0.0-0.0)	<0.0001
50-59 years	3831	32.5 (31.6-33.4)	54.6 (53.7-55.5)	36.7 (35.2-38.2)	
60-79 years	713	4.7 (3.2-6.2)	26.4 (25.0-27.9)	63.3 (62.4-64.2)	
Social class I	656	6.1 (4.6-7.6)	3.5 (2.2-5.0)	6.1 (4.6-7.6)	<0.0001
Social class II	2619	24.1 (23.0-25.2)	14.4 (13.3-15.5)	24.5 (23.4-26.6)	
Social class III	7906	69.8 (69.2-70.4)	82.2 (81.6-82.8)	69.4 (68.8-70.0)	
Non-smokers	7522	72.1 (71.6-72.7)	9.7 (9.1-10.3)	0.0 (0.0-0.0)	<0.0001
Smokers	3659	27.9 (27.0-28.8)	90.3 (89.4-91.2)	100.0 (99.1-100.0)	
		<5	5-9	≥ 10	
Men	n	% (95% CI)	% (95% CI)	% (95% CI)	p-value
40-49 years	9557	86.1 (85.6-86.6)	36.2 (35.7-36.7)	18.5 (18.0-19.0)	<0.0001
50-59 years	6221	12.9 (12.2-13.6)	52.5 (51.8-53.2)	19.5 (18.4-20.6)	
60-79 years	1275	0.9 (0.5-1.7)	11.3 (10.2-12.4)	64.0 (63.3-64.7)	
Social class I	870	6.0 (4.6-7.4)	4.6 (3.2-6.0)	3.5 (2.1-4.9)	<0.0001
Social class II	2852	17.4 (16.3-18.5)	16.9 (15.8-18.0)	13.6 (12.5-14.7)	
Social class III	13331	76.5 (76.2-76.8)	78.5 (78.2-78.8)	82.9 (82.6-83.2)	
Non-smokers	11487	88.5 (88.1-88.9)	58.3 (57.9-58.7)	23.8 (23.4-24.2)	<0.0001
Smokers	5566	11.5 (10.7-12.3)	41.7 (40.9-42.5)	76.2 (75.4-77.0)	

In the multivariate analysis by binary logistic regression with the Wald model, all those variables that presented statistically significant differences in the bivariate analyses were established as covariates, i.e. age 60 years and older, male sex, social classes II-III and smoking. The variable that most increased the risk of presenting high Globorisk values was male sex with an OR of 39.71 (95% CI 29.79-52.92). The other variables such as smoking, social class and age also increase the risk of presenting high Globorisk values. The complete data can be seen in **figure 2**.

Figure 2: Logistic regresión analysis.



Discussion

Nowadays, it is internationally accepted that cardiometabolic risk factors should be treated based on cardiovascular risk and not based on individual numbers[10].

In our study in the population of the Czech Republic, the prevalence of high values of the Globorisk scale increases with age, as one descends in social class and if one consumes tobacco. The variable that most increases the risk of presenting high values of this scale is the male sex. These results coincide with those of Hajifathalian et al. with regard to age, tobacco and male sex[7]. Although in this study no tables are presented for the population of the Czech Republic, in all the tables of the different countries we find the same effect, varying the cardiovascular risk according to the country and the geographical area. Neither is a relationship established with social class in this study, which we have also found has a great influence on our results.

This study, in which data from different countries were collected, showed that the prevalence of people at high risk of fatal cardiovascular disease was lower in developed countries such as South Korea, Spain and Denmark, where only 5-10% of men and women had more than a 10% cardiovascular risk at 10 years, and 62-76% of men and 79-82% of women had less than 3% risk. In contrast, the proportion of people at high risk was higher in China and Mexico. In China, 33% of men and 28% of women had a 10-year risk of fatal cardiovascular disease of 10% or more, while in Mexico, the prevalence of this high risk was 15% for men and 11% for women. The risk prevalence of less than 3% was 37% for men and 42% for women in China, and 54% for men and 68% for women in Mexico[7].

However, this higher cardiovascular risk ratio in lower social classes obtained in our study coincides with the results obtained by Ueda et al., who find a greater cardiovascular risk both in the lowest social classes and in the countries with lower or middle income[11].

In the literature reviewed, we have only found one study carried out in 182 countries that included data from the Czech population, in which the prevalence of high cardiovascular risk values is higher than that of our study. While both agree that cardiovascular risk in the Czech population is much higher in men than in women[11].

The rest of the studies found have been performed in third world populations, thus a study performed in several African countries[12] found mean risk values with the Globorisk scale of 2-6%, lower than ours. However, the results highlight different 10-year CVD risk levels by region, with lower levels of estimated risk observed in rural West African sites, higher levels in the urban Nairobi site, and higher levels in all three South African sites. Importantly, the rural sites in South Africa had populations with higher levels of estimated risk than the urban site in Nairobi. Regardless of the algorithm used, men were found to have higher levels of 10-year predicted risk than women at all sites[12]. The variability between regions and geographical areas had already been described by Hajifathalian et al. in 2015[7].

Another study in Burkina Faso also found mean values of the scale and prevalence of high Globorisk values lower than those obtained by us. However, this work comes from a secondary analysis of data from the first cross-sectional survey at the national level on risk factors for noncommunicable diseases in Burkina Faso, so there could be an under-declaration. Furthermore, the sample size was low and could cause a low precision of the measured associations[13]. A study in people with diabetes in Bangladesh found a prevalence of high values of 37%, which is much higher than ours. In this case, we must bear in mind that all people were diabetic, and that the American Heart Association warns that diabetic people are 2 to 4 times more likely to die from heart disease than non-diabetics, and at least 68% of them aged 65 and over die from some form of heart disease[14].

Other investigations[15] have also found, as we did, a positive association between higher social class and non-tobacco use and a lower CVR with the Globorisk scale.

Strenghts and limitations

As strong points we would highlight that this is the first study carried out in our country using this scale, in addition the sample size is very large (more than 28,000 people) and the influence of sociodemographic variables such as social class, which is rarely taken into account, is assessed.

The main limitation is the impossibility of comparing our results with those obtained by other authors in our country, since there are no other studies similar to ours.

Conclusion

We consider the use of the Globorisk scale to determine CVR to be of interest, since there is a scale for each of the countries adapted to the characteristics of the population.

Interests conflict

The authors declare no conflict of interest.

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