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Global cardiovascular risk in elderly people linked to community-based physical activity programs

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ARTICLE INFORMATION

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Abbreviations
CRF: Cardiovascular risk factors
GCR: Global cardiovascular risk
HBP: High blood pressure
WHO: World Health Organization

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ABSTRACT

Introduction: Determining the global cardiovascular risk is an important tool in order to establish prevention strategies for cardiovascular diseases, which represent the first cause of death in Cuba.

Objectives: To determine the global cardiovascular risk in the elderly people linked to the community-based physical activity programs of the Lindo Amanecer project, from Arroyo Naranjo municipality.

Methods: A cross-sectional descriptive observational study was carried out. The study's population consisted of 120 elderly people, of whom 106 were interviewed from April to October 2018. Global cardiovascular risk was calculated using the criteria of the World Health Organization's global cardiovascular risk prediction tables.

Results: A 91.51% of the studied population was female and those over 70 years old predominated (54.72%). A 47.17% of those surveyed had systolic blood pressure figures higher than or equal to 140 mmHg, and 35.85% had total cholesterol figures above 6 mmol/L. Moderate cardiovascular risk (38.68%) predominated, followed by low risk (35.85%).

Conclusions: Low and moderate global cardiovascular risk levels behaved similarly. High systolic blood pressure, diabetes mellitus, and hypercholesterolemia were the modifiable risk factors most associated with increased global cardiovascular risk.

Keywords: Risk factors, Risk, Risk assessment, Cardiovascular diseases, Cardiovascular risk, Global cardiovascular risk

Riesgo cardiovascular global en el adulto mayor vinculado a los programas de actividad física comunitaria

RESUMEN

Introducción: La determinación del riesgo cardiovascular global constituye una herramienta importante para poder establecer estrategias de prevención para las enfermedades cardiovasculares, que en Cuba constituyen la primera causa de muerte.

Objetivo: Determinar el riesgo cardiovascular global en el adulto mayor vinculado a los programas de actividad física comunitaria del proyecto Lindo Amanecer del municipio Arroyo Naranjo.

Método: Se realizó un estudio observacional descriptivo de corte transversal. El universo de estudio lo constituyeron 120 adultos mayores, de los que se entrevis-

Authors' contribution
APR and LEGB: Idea and design of the research; data collection, analysis and interpretation and manuscript writing.
DEL, EPA y ECG: Data analysis and interpretation as well as helping in the manuscript writing.
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taron a 106 en el período de abril de 2018 a octubre de 2018. Se realizó el cálculo del riesgo cardiovascular global mediante los criterios de las tablas de predicción del riesgo cardiovascular global de la Organización Mundial de la Salud.
Resultados: El 91,51% de las personas estudiadas son del sexo femenino y predominaron los mayores de 70 años (54,72%). Un 47,17% de los encuestados presentaron cifras de presión arterial sistólica mayor o igual a 140 mmHg, y un 35,85% tenían cifras de colesterol total por encima de 6 mmol/L. Predominó el riesgo cardiovascular moderado (38,68%) seguido del riesgo bajo (35,85%).
Conclusiones: Los niveles de riesgo cardiovascular global bajo y moderado se comportaron de forma similar. Las cifras elevadas de presión arterial sistólica, la diabetes mellitus y la hipercolesterolemia son los factores de riesgo modificables que más se asociaron con el aumento del riesgo cardiovascular global.
Palabras clave: Factores de riesgo, Riesgo, Medición de riesgo, Enfermedades cardiovasculares, Riesgo cardiovascular, Riesgo cardiovascular global

INTRODUCTION

Cardiovascular diseases are one of the most important causes of disability and premature death worldwide, and they represent the first cause of death in Cuba[1-3]. Detecting and controlling cardiovascular risk factors (CRF) such as: high blood pressure (HBP), diabetes mellitus, obesity, dyslipidemia and tobacco smoking, among others, continues to be the fundamental strategy to prevent them. One of the best tools for establishing priorities in primary prevention is to estimate the risk of developing a cardiovascular disease in the next 10 years[4-8].

Calculating the risk of suffering from them is based on the CRF identified from the Framingham study, which has been researching the incidence of cardiovascular diseases and their CRF since 1948. From this study, the concept of global cardiovascular risk (GCR) was born in the 1990s, which includes the CRF in tables that stratify the risk and determine the probability of presenting this type disease in five or ten years[6,9-12].

In the early 1990s, the first version of the classic Framingham risk score and tables was published (Anderson 1991)[13]. Subsequently, the authors established a calibration method for their adaptation so that they could be used in different populations. Since then, multiple tables have been developed for calculating risk, similar to Framingham´s, by category: in 1998 by Wilson[14]; later, in 1999, Grundy[15] made a small modification to these tables, considering diabetes as basal glucose > 126 mg/dL (according to the new criteria of the American Diabetes Association); in addition, they were able to calculate the risk of presenting what they called "hard events", which includes only unstable angina, acute myocardial infarction and coronary death[15]. Other tables for calculating the GCR are REGICOR[16] for Spain, in 2003; tables of New Zealand, Sheffield, SCORE, PROCAM[17-19] and, since 2008, the tables for estimating and treating cardiovascular risk of the World Health Organization (WHO)[20], designed for different regions of the world.

Risk tables are simplified estimation methods, based on mathematical functions that model the risk of individuals from different cohorts of followed-up populations, generally, during ten years. They establish a mathematical algorithm that makes it possible to obtain the probability percentage of developing a cardiovascular event in this period of time, but it is absolutely necessary that the data are representative in the population whose risk is to be calculated. This estimation, taken to an individual scale, supports the decision making process and facilitates to stablish priorities in preventive actions[6,11,14,16].

In Cuba, there are few studies published on GCR and we do not have Cuban risk tables, which are necessary to carry out interventions on high and medium risk groups. In primary health care, in order to carry out an appropriate primary prevention work, it is necessary to know the cardiovascular risk of the population in general and of each individual in particular. We do not know how the GCR behaves in people linked to the community-based physical activity programs of the *Lindo Amanecer* project from the Arroyo Naranjo municipality in Havana, thus, it was justified to carry out this study with the aim of determining the global cardiovascular risk in the elderly people linked to community-based physical activity programs.

METHOD

A cross-sectional descriptive observational study was carried out in all persons linked to the community-based physical activity programs of the *Lindo Amanecer* project, in Arroyo Naranjo municipality (Havana, Cuba). The study´s population consisted of 120 elderly people belonging to the "Ciro Frías" sport complex of Arroyo Naranjo municipality, of whom 106 were interviewed from April to October 2018.

The criteria of the WHO's GCR prediction tables[20], specific for the region of the Americas were followed: the AMR A. These tables indicate the risk of suffering a serious cardiovascular event, whether fatal or not, over a 10-years period according to: age, sex, systolic blood pressure, tobacco smoking, total blood cholesterol and the presence or absence of diabetes mellitus.

Procedures

The aim of the study was explained to all the studied persons and they were asked for their consent to apply the primary data collection form, which collected general data on identity, age, date of birth, sex, blood pressure figures; as well as history of high blood pressure, dyslipidemia, ischemic heart disease, diabetes mellitus and smoking habits. Persons diagnosed with established atherosclerotic cardiovascular disease, cerebrovascular and peripheral vascular diseases, and chronic renal failure were excluded from the study; as were persons who did not agree to take part in the research.

The blood pressure measurement was carried out following the criteria of the Cuban guideline for prevention, diagnosis and treatment of high blood pressure from 2008[4]. All persons had a blood extraction by means of a cubital venipuncture for determining the total cholesterol (mmol/L), which was carried out in the clinical laboratory of the *Instituto de Medicina del Deporte* (Havana, Cuba).

Technique for the determination of the global cardiovascular risk

The WHO's charts[20] were used and the appropriate one was selected according to:

- The person's place of residence. In the case of Cuba, the America AMR A table was used (**Figure**).
- Presence or not of diabetes mellitus.
- Sex: male or female
- Smoking habit: a person was considered a smoker if he or she smokes regularly or if he or she quit the habit up to one year before the survey.
- Age: age groups from 60 years old on were selected.

The horizontal line corresponding to systolic blood pressure figure is then selected: 120 if it is less than 140 mmHg, 140 (140-159 mmHg), 160 (160-179 mmHg) and 180 if it is higher than this figure. And we proceeded in a similar way to select, on the vertical line, the box that corresponds to the total blood cholesterol value: four if it is less than 5 mmol/L, five (5.0-159 mmol/L), six (6.0-6.9 mmol/L), seven (7.0-7.9 mmol/L) and eight when it is higher than this value.

The color of the selected box corresponds to the GRF GCR level (**Table 1**).

Information processing and analysis technique

A database in Microsoft Excel (Microsoft Office XP 2013) was created from the primary data collection form. The Statistical Package for the Social Sciences (SPSS) version 23 for Windows was used to process the results. The descriptive variables were expressed in percentages and, for the comparison of two variables under study, the non-parametric statistical method of Chi square was used with a significance level of 0.05.

The obtained results are presented in a table, where the information was summarized in order to approach the proposed objective; later, a descriptive analysis of the studied phenomenon was carried out that allowed, through the process of synthesis and generalization, to arrive to conclusions.

Ethical considerations

Each person was asked to express her/his willingness to be included in the research, which she/he expressed by signing the informed consent form. The aim and importance of participating in this

Table 1. Interpretation of the global cardiovascular risk level.

Color	Risk percentage	Risk level
Level 1. Green	<10%	Low
Level 2. Yellow	10 – 19,9 %	Moderate
Level 3. Orange	20 – 29,9 %	High
Level 4. Red	30 – 39,9 %	Very high
Level 5. Brown	≤ 40 %	Extremely high

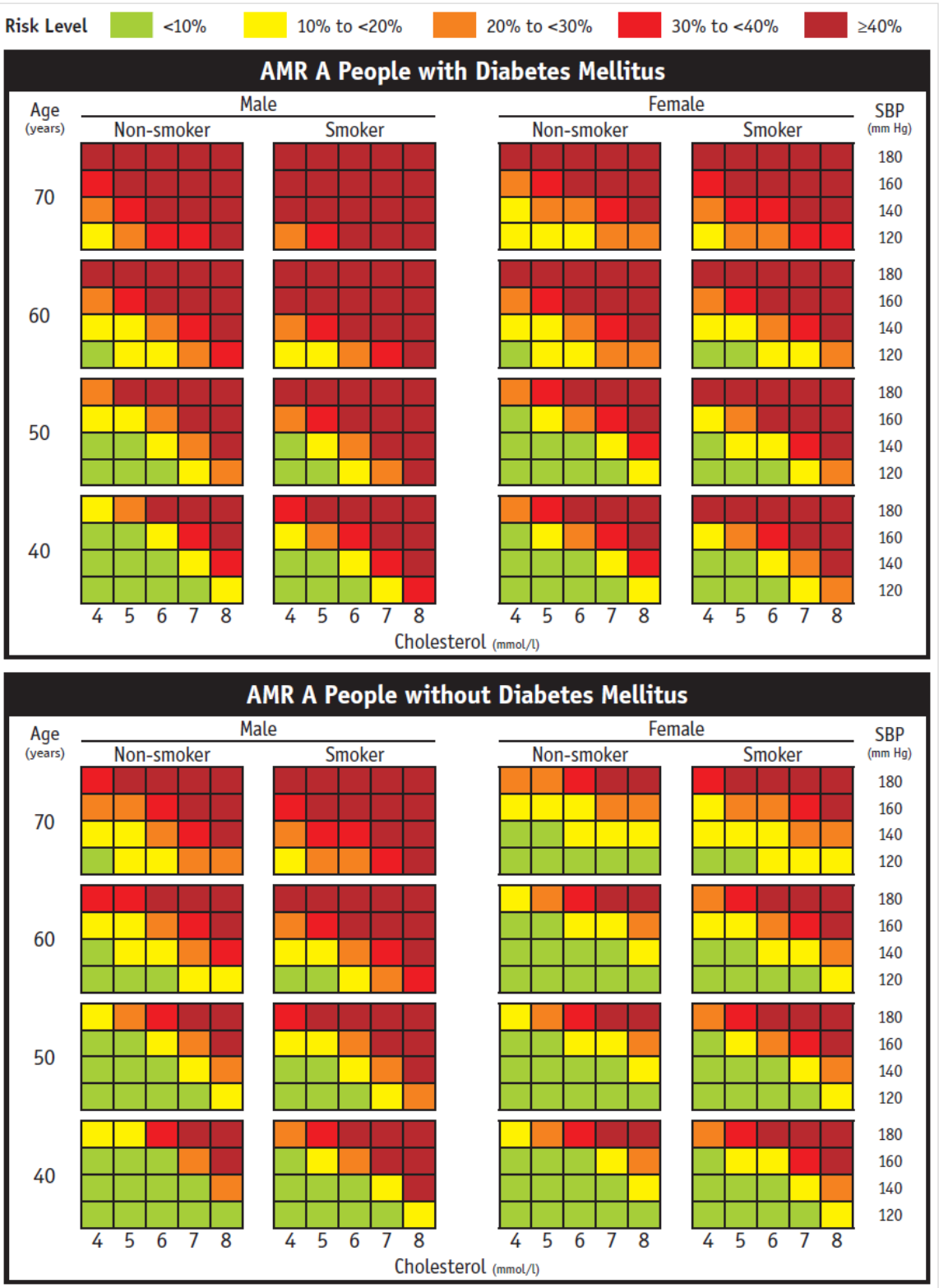

Figure. WHO/ISH risk prediction chart for AMR A, for use in settings where total blood cholesterol can be measured. 10-year risk of a fatal or non-fatal cardiovascular event by gender, age, systolic blood pressure, total blood cholesterol, smoking status and presence or absence of diabetes mellitus.
Taken from: WHO. *Prevención de las enfermedades cardiovasculares: guía de bolsillo para la estimación y el manejo del riesgo cardiovascular*. Ginebra: WHO; 2008[20]. With permission from the World Health Organization (ID: 363583 of 2020).
IHS, International Hypertension Society; WHO, World Health Organization.

study was also explained to them clarifying that, in case of not doing it, it would not bring about any harm for themselves.

RESULTS

The distribution of the 106 elderly people according to the different variables and their GCR is shown in **table 2**. A 54.72% of persons are in the age group of 70 years old or older and a 38.68% presented moderate risk, followed by low risk (35.85%). The rest (25.47%) was distributed among the high, very high and extremely high risk categories. The Chi square calculation showed an association between the two variables (age and GCR, $p<0.05$), so that as age increases, there is also an increase in the GCR.

The 91.51% of the studied persons was female. A 36.08% of them presented low risk, similar to that of males (33.33%), as it happened with moderate risk (39.18 *vs.* 33.33%). However, in the remaining categories there was a clear predominance of women, therefore, despite the low representation of males, a significant statistical difference was found ($p<0.05$).

Although there was a predominance of non-smokers, with normal values of glycemia, total cholesterol and blood pressure, the presence of diabetes mellitus (31.13%), smoking habit (6.6%), HBP (47.17%) and hypercholesterolemia (35.84%) had a significant statistical association ($p<0.05$) with the increase of the GCR.

DISCUSSION

Risk stratification using GCR calculation tables is the first step in identifying persons who require preventive and therapeutic measures to reduce cardiovascular morbidity and mortality. Determining GCR allows a more efficient decision making than when evaluating CRF separately, especially in high-risk patients. In persons at low and moderate risk, it allows to establish strategies for the promotion of heart-healthy lifestyles[21-25].

In our study, as age increases, an increase in GCR is also evident. The population aging is associated with an increase in the prevalence of cardiovascular diseases, which are among the diseases that most affect elderly people and which are also the leading cause of mortality in both sexes.

Elderly population is mainly composed of women. However, they tend to lose some of the advantages they had in terms of cardiovascular disease incidence as they grow older. When menopause takes place, the risk of coronary heart diseases increases sharply and the risk is equal to that of men[26]. In this study, there is a predominance of the female sex that showed a significant association with the increase in GCR.

The prevalence of HBP is high in elderly people and isolated systolic high blood pressure, which predominates in this group of persons, is a predisposing factor for the development of cardiovascular diseases. High blood pressure reaches special relevance in elderly population and it is the most relevant CRF in this age group in both sexes. Together with hyperlipidemia, diabetes mellitus and tobacco smoking it represents one of the four major CRF on which we can act, and which contribute to cardiovascular disease.

According to the DARIOS[7] study, the HBP standardized prevalence in the Spanish population between 35 and 74 years old was estimated in a 43%, hypercholesterolemia in a 41%, tobacco smoking in a 27% and diabetes in a 13%. In our study, the studied persons who presented figures of systolic blood pressure above 140 mmHg coincide with the prevalence of HBP in the DARIOS study, but there are differences regarding hypercholesterolemia and smoking habit (in ours it was inferior) as well as regarding diabetes mellitus, since in our research a higher prevalence was found.

Rodríguez Sánchez *et al*[26], studied the prevalence of cardiovascular diseases and CRF in persons over 65 years old in the city of Salamanca, Spain. They interviewed 327 persons with a mean age of 76 years old and they found HBP (67.6%), hypercholesterolemia (23.9%), diabetes mellitus (31.5%) and smoking habit (7.3%). The last two coincide with the outcomes of this research, but we found less HBP and more hypercholesterolemia.

Paramio Rodríguez *et al*[27], determined the GCR in 152 persons over 60 years old, in a population of the state of Táchira, Venezuela, according to the criteria of the WHO's GCR prediction tables. They classified as moderate risk a 47.37% of the persons and 32.24% were among the high, very high and extremely high risk levels. The 58.55% had systolic blood pressure above 140 mmHg, the 55.26% total cholesterol above 6.0 mmol/L, the 15.79% diabetes mellitus and the 8.55% smoking habit. The results of the current research coincide with these criteria of low and moderate risk, but less HBP and hypercholesterolemia were found, the percentage of people with diabetes

Table 2. Global cardiovascular risk according to age group, sex, diabetes mellitus, smoking habit, systolic blood pressure and total cholesterol figures.

Variables	Global cardiovascular risk (%)					Total	p
	< 10	10 – 19.9	20 – 29.9	30 – 39.9	≥ 40		
Age groups (years)							
40 - 49	1(100)	0 (0)	0 (0)	0 (0)	0 (0)	**1 (0.94)**	< 0.05
50 - 59	7 (77.78)	2 (22.22)	0 (0)	0 (0)	0 (0)	**9 (8.49)**	
60 - 69	11 (28.95)	17 (44.74)	7 (18.42)	3 (7.89)	0 (0)	**38 (35.85)**	
≥ 70	19 (32.76)	22 (37.93)	10 (17.24)	6 (10.34)	1 (1.72)	**58 (54.72)**	
Sex							
Female	35 (36.08)	38 (39.18)	16 (16.49)	7 (7.22)	1 (1.03)	**97 (91.51)**	< 0.05
Male	3 (33.33)	3 (33.33)	1 (11.11)	2 (22.22)	0 (0)	**9 (8.49)**	
Diabetes mellitus							
No	36 (49.32)	25 (34.25)	9 (12.33)	3 (4.11)	0 (0)	**73 (68.87)**	< 0.05
Yes	2 (6.06)	16 (48.48)	8 (24.24)	6 (18.18)	1 (3.03)	**33 (31.13)**	
Smoking habit							
No	36 (36.36)	40 (40.40)	14 (14.14)	8 (8.08)	1 (1.01)	**99 (93.40)**	< 0.05
Yes	2 (28.57)	1 (14.29)	3 (42.86)	1 (14.29)	0 (0)	**7 (6.60)**	
Systolic blood pressure (mmHg)							
< 140	30 (53.57)	20 (35.71)	5 (8.93)	1 (1.79)	0 (0)	**56 (52.83)**	< 0.05
140 - 159	6 (17.65)	12 (35.29)	11 (32.35)	4 (11.76)	1 (2.94)	**34 (32.08)**	
160 - 179	2 (12.50)	9 (56.25)	1 (6.25)	4 (25)	0 (0)	**16 (15.09)**	
≥ 180	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	**0 (0)**	
Total cholesterol (mmol/L)							
3.0 - 4.9	22 (70.97)	8 (25.81)	1 (3.23)	0 (0)	0 (0)	**31 (29.25)**	< 0.05
5.0 - 5.9	11 (29.73)	19 (51.35)	6 (16.22)	1 (2.70)	0 (0)	**37 (34.91)**	
6.0 - 6.9	2 (9.52)	12 (57.14)	3 (14.29)	4 (19.05)	0 (0)	**21 (19.81)**	
7.0 - 7.9	3 (27.27)	1 (9.09)	4 (36.36)	3 (27.27)	0 (0)	**11 (10.37)**	
≥ 8	0 (0)	1 (16.67)	3 (50)	1 (16.67)	1 (16.67)	**6 (5.66)**	
Total	**38 (35.85)**	**41 (38.68)**	**17 (16.04)**	**9 (8.49)**	**1 (0.94)**	**106 (100)**	

Data express n (%)

mellitus was doubled and in smokers the percentage was similar.

On their side, de la Noval García *et al*[28], estimated the GCR in 1 287 persons between 40 and 70 years old, with the same WHO's prediction criteria, and they found low (93.6%), moderate (4%), high (1.2%), very high (0.6%) and extremely high (0.5%) risk; which does not correspond with our study, nor does the prevalence of HBP (25%), hypercholesterolemia (18.3%) and smoking habit (24.5%). It has been described in the bibliography that this bad habit decreases with age, and the target population of our research is the elderly one.

Dueñas Herrera *et al*[29] determined the GCR in 301 workers from Meliá Cohíba Hotel (Cuba) using Framingham classic risk tables, and there are the two main reasons why their results do not coincide with ours: they studied persons in working age –it has

been demonstrated that as age increases, there is an increase of GCR as well– and they did not use the same risk tables. Something similar happened with the results found by González de la Fé *et al*[30], since they assessed GCR in 937 patients between 35 and 74 years old, in a family doctor's office and, although they followed the same criteria of the WHO's GCR prediction tables specific for the region of the Americas (AMR A), they did so in the context of not being able to measure blood cholesterol, hence, they also used Gaziano tables, without the contribution of the clinical laboratory.

The advantages of correcting CRF in elderly adults improve the global multivariate risk, thus, pessimism about the prevention of cardiovascular diseases in this population group is not justified; the modifiable CRF that are identified continue to be important in primary and secondary prevention of elderly adults. Preventive measures have a positive effect on their life quality, and determining GCR is the most effective and cost-effective measure for decision-making in cardiovascular prevention.

Community-based physical activity programs in the elderly people successfully modify the loss of functions, such as strength, flexibility, coordination, and balance, and they also decrease morbidity and mortality due to cardiovascular diseases.

Stratification of cardiovascular risk through scales is a key pillar in therapeutic decision-making in primary health care. Determining GCR is the cornerstone for establishing prevention policies for cardiovascular diseases.

CONCLUSIONS

Low and moderate global cardiovascular risk levels behaved similarly. High systolic blood pressure, diabetes mellitus, and hypercholesterolemia were the modifiable risk factors most associated with increased global cardiovascular risk.

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