Cardiac risk in elderly individuals attended by basic health units[1]

Risco cardiaco em idosos atendidos em unidades básicas de saúde

Riesgo cardíaco en ancianos atendidos en unidades básicas de salud

[Research Article]

Estélio Henrique Martin Dantas[2]
Karollyni Bastos Andrade Dantas[3]
Anne Caroline Siqueira Alves[4]
Maria Beatriz Porto Santana[5]
Maria Eduarda Silva Sandes[6]
Moisés Silva de Amorim[7]
Rafaela Baptista de Almeida Bastos[8]
Lúcio Flávio Gomes Ribeiro da Costa[9]

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[2] Health and Environment Master's and Doctoral Degree Program at Tiradentes University - UNIT, Aracaju, Brazil. Tiradentes University - UNIT's Undergraduate Medical Program in Aracaju, Brazil. Nursing and Biosciences Doctoral Degree Program at the Federal University of the State of Rio de Janeiro - UNIRIO, Rio de Janeiro, Brazil. ORCID: https://orcid.org/0000-0003-0981-802; e-mail: estelio.henrique@souunit.com.br

[3] Health and Environment Master's and Doctoral Degree Program at Tiradentes University - UNIT, Aracaju, Brazil ORCID: https://orcid.org/0000-0001-6886-6976; e-mail: karollbdantas@gmail.com

[4] Tiradentes University - UNIT's Undergraduate Medical Program in Aracaju, Brazil. ORCID: https://orcid.org/0009-0009-5378-9168; e-mail: anne.siqueira@souunit.com.br

[5] Tiradentes University - UNIT's Undergraduate Medical Program in Aracaju, Brazil. ORCID: https://orcid.org/0009-0002-5854-4046; e-mail: maria.bporto@souunit.com.br

[6] Tiradentes University - UNIT's Undergraduate Medical Program in Aracaju, Brazil. ORCID: https://orcid.org/0009-0003-9558-2823; e-mail: maria.esandes@souunit.com.br

[7] Tiradentes University - UNIT's Undergraduate Medical Program in Aracaju, Brazil. ORCID: https://orcid.org/0000-0001-6134-7380; e-mail: moises.amorim@souunit.com.br

[8] Tiradentes University - UNIT's Undergraduate Medical Program in Aracaju, Brazil. ORCID: https://orcid.org/0009-0005-8891-1179; e-mail: rafaela.baptista@souunit.com.br

[9] Health and Environment Master's and Doctoral Degree Program at Tiradentes University - UNIT, Aracaju, Brazil. ORCID: https://orcid.org/0000-0002-3437-8701; e-mail: luciojudo@hotmail.com

Abstract

The objective was to assess the cardiac risk of elderly individuals attending Basic Health Units (UBS) in the North and South zones of Aracaju, SE. To achieve this objective, the study employed the Framingham Risk Score, which takes into account multiple cardiovascular risk factors, including age, blood pressure, heart rate, cholesterol levels, body composition, and other pertinent indicators. It's worth noting that some of these factors can be modified, while others cannot. A total of 76 elderly individuals participated in the study ($\bar{X}$ = 67 ± 6.07 years). The highest mean values for cardiovascular risk factors were found for total cholesterol ($\bar{X}$ = 199.10 ± 43.57 mg/dL) and low density lipoprotein ($\bar{X}$ = 129.57 ± 34.85 mg/dL), followed by the systolic blood pressure ($\bar{X}$ = 124.8 ± 19.88 bpm). The cardiovascular risk of the sample group was characterized as high ($\bar{X}$ = 0.29% ± 1.5%). Furthermore, the mentioned percentage delta reflects the change in value over a specific period, providing insights into relative changes in a dynamic context. The outcome of this study was a comprehensive assessment of the cardiac risk in these UBS attendees, contributing to the understanding and appropriate treatment of cardiovascular conditions in this population.

Keywords: cardiovascular diseases, hypertension, risk factors for heart disease.

Resumo: O objetivo foi avaliar o risco cardíaco de idosos atendidos em Unidades Básicas de Saúde (UBS) das zonas Norte e Sul de Aracaju, SE. Para atingir esse objetivo, o estudo utilizou o Escore de Risco de Framingham, que leva em consideração múltiplos fatores de risco cardiovascular, incluindo idade, pressão arterial, frequência cardíaca, níveis de colesterol, composição corporal e outros indicadores pertinentes. Vale ressaltar que alguns desses fatores podem ser modificados, enquanto outros não. Participaram do estudo 76 idosos ($\bar{X}$ = 67 ± 6,07 anos). Os maiores valores médios de fatores de risco cardiovasculares foram encontrados para colesterol total ($\underline{X}$ = 199,10 ± 43,57 mg/dL) e lipoproteína de baixa densidade ($\bar{X}$ = 129,57 ± 34,85 mg/dL), seguidos da pressão arterial sistólica ($\bar{X}$ = 124,8 ± 19,88 bpm). O risco cardiovascular do grupo amostral foi caracterizado como elevado ($\bar{X}$ = 0,29% ± 1,5%). Ademais, o delta percentual citado reflete a mudança no valor durante um determinado período, fornecendo informações sobre as mudanças relativas num contexto dinâmico. O resultado deste estudo foi uma avaliação abrangente do risco cardíaco nesses usuários da UBS, contribuindo para a compreensão e o tratamento adequado das condições cardiovasculares nessa população.

Palavras-chave: doenças cardiovasculares, hipertensão, fatores de risco para doenças cardíacas.

Resumen: El objetivo fue evaluar el riesgo cardíaco de ancianos que asisten a Unidades Básicas de Salud (UBS) de las zonas Norte y Sur de Aracaju, SE. Para lograr este objetivo,

el estudio empleó la puntuación de riesgo de Framingham, que tiene en cuenta múltiples factores de riesgo cardiovascular, incluida la edad, la presión arterial, la frecuencia cardíaca, los niveles de colesterol, la composición corporal y otros indicadores pertinentes. Vale la pena señalar que algunos de estos factores se pueden modificar, mientras que otros no. Participaron del estudio 76 ancianos ($\bar{X}$ = 67 ± 6,07 años). Los valores medios más altos de los factores de riesgo cardiovascular se encontraron para el colesterol total ($\bar{X}$ = 199,10 ± 43,57 mg/dL) y las lipoproteínas de baja densidad ($\bar{X}$ = 129,57 ± 34,85 mg/dL), seguidos de la presión arterial sistólica ($\bar{X}$ = 124,8 ± 19,88 lpm). El riesgo cardiovascular del grupo de muestra se caracterizó como alto ($\bar{X}$ = 0,29% ± 1,5%). Además, el delta porcentual mencionado refleja el cambio en el valor durante un período específico, proporcionando información sobre las variaciones relativas en un contexto dinámico. El resultado de este estudio fue una evaluación integral del riesgo cardíaco en estos asistentes a la UBS, contribuyendo para la comprensión y el tratamiento adecuado de las condiciones cardiovasculares en esta población.
Palabras clave: enfermedades cardiovasculares, hipertensión, factores de riesgo de enfermedad cardíaca.

Introduction

Cardiovascular diseases are the leading causes of death and healthcare costs in developed countries (Candelino et al., 2022). Since this group of diseases has a significant negative impact on society, it is of utmost importance to map and control the precursors that lead to cardiovascular risks and potentially various pathologies.

Presently, it is widely recognized that the accumulation of cardiovascular risk factors throughout one's life significantly impacts the health of the elderly. These risk factors can be categorized as modifiable and non-modifiable, often closely associated with metabolic comorbidities in older individuals, particularly in the context of conditions like obesity and diabetes mellitus (PINHEIRO et al., 2023).

The Framingham Risk Score (FRS) is one of the existing methodologies to analyze the risk of cardiovascular disease based on the presence or absence of modifiable and non-modifiable factors. The stratification of Framingham model components by risk groups and gender indicates that, in the case of women, the factors that had the most significant impact on cardiovascular risk were systolic blood pressure, total cholesterol, HDL (High-Density Lipoprotein), diabetes, and smoking. (TRIMARCO et al, 2022).

Promoting a healthy lifestyle that incorporates physical exercise is one strategy for mitigating cardiovascular risk factors. This approach can have a positive influence on a range of factors, including body mass, blood pressure, insulin sensitivity, lipid and glucose metabolism, cardiac function, endothelial function, and body composition. Wu et al. (2019) highlight the recommendation of regular moderate-intensity exercise as beneficial for cardiovascular health. Additionally, following a physical exercise

intervention, there was a decrease in average total cholesterol and LDL levels, coupled with an increase in HDL cholesterol levels. (CASSIANO et al., 2020).

With the aim of addressing the above, this investigation will focus on examining variables related to the cardiovascular status of these individuals, taking into account parameters such as blood pressure, heart rate, cholesterol levels, and body composition, and other relevant indicators.

To measure cardiac risk, the Framingham Risk Score, a widely recognized tool for assessing cardiovascular risk (SOFOGIANNI et al., 2022), will be used.

Hence, the aim of this study is to assess the cardiac risk among elderly individuals, providing valuable insights for the development of more effective approaches in promoting cardiovascular health in this population.

Methodology

This research was conducted in a quantitative, cross-sectional, and descriptive study format.

Population, Sampling, and Sample

The study's population consists of elderly individuals served by the Basic Health Units (UBS) in the following neighborhoods of the city of Aracaju: Aeroporto, Atalaia, Castelo Branco, Coroa do Meio, Farolândia, Grageru, Inácio Barbosa, Jabotiana, and Ponto Novo. The covered UBSs are as follows: UBS Antônio Alves; UBS Augusto Franco; UBS Augusto César Leite; UBS Ávila Nabuco; UBS Dona Sinhazinha; UBS Fernando Sampaio; UBS Geraldo Magela; UBS Hugo Gurgel; UBS Dr. Max de Carvalho; UBS Madre Tereza de Calcutá, and UBS Manoel de Souza Pereira .

Initially, all UBSs were visited. Elderly individuals who frequent the UBSs were invited to attend a preliminary lecture held at the Farolândia Campus, where the project, assessments, expected benefits, ethical aspects, and any existing doubts were explained. At the end of the lecture, an invitation was extended for them to participate in the project.

Volunteers from the UBSs were asked to bring a medical certificate authorizing them to engage in physical exercise, a referral from their respective UBS, identification, and a CPF (Individual Taxpayer Identification Number) to the Laboratory of Biosciences of Human Motricity – LABIMH.

Upon arrival, they were screened based on inclusion criteria (being over 60 years old and committing to participating in a physical exercise program by signing an

Informed Consent Form) and exclusion criteria (having motor limitations or comorbidities that would prevent them from participating in exercise programs).

All pre-selected individuals were screened using the Revised Physical Activity Readiness Questionnaire (rPAR-Q) to assess their safety in participating in the assessments and answered a questionnaire to identify the socioeconomic characteristics of the sample group.

Research ethics

This study adhered to all ethical principles outlined in the Helsinki Declaration (WMA, 2013), as well as Resolution 466/12 of the National Health Council dated 12/12/2012 (Brazil, 2012). All participants were instructed and provided with information regarding the Informed Consent Form (ICF), which outlined the risks, benefits, and social relevance of the research with advantages for the study subjects.

The research was previously approved by the Ethics Committee on Human Research of Universidade Tiradentes, under protocol number 3.936.886, with CAAE (Certificate of Presentation for Ethical Appreciation) number: 26524719.4.0000.5371.

Diagnostic evaluation (DE)

After conducting the preliminary procedures (participant recruitment, ethical and participant safety precautions, group stratification), all study participants underwent a diagnostic evaluation in which data on the study variables were collected. This included Blood Pressure, Heart Rate, Total Cholesterol, Cholesterol, Glucose, and Framingham Risk Score (FRS).

The following indicators of the elderly participants' biophysical behavior were used:

a. Blood Biochemistry: Lipid levels and blood glucose of the participants were assessed through recent laboratory tests provided by the participants themselves.

b. Blood Pressure: Blood pressure values were determined using the indirect method, employing cuffs with rubber bladders of widths compatible with the participants' brachial circumference (8, 12, and 15 cm), using a manual device called a sphygmomanometer from the Premium brand - Brazil.

c. Heart Rate: POLAR heart rate monitors (USA) were utilized in all intervention group training sessions to monitor all participants.

Cardiovascular markers or cardiovascular biomarkers are essential elements in the accurate diagnosis of various cardiovascular diseases. These biomarkers are measurable peptides, proteins, or enzymes in the plasma that reveal diagnostic and prognostic value in an unknown disease process (Martinez et al., 2019).

Cardiovascular risk biomarkers encompass lipid biomarkers (such as cholesterol associated with high-density lipoproteins, triglycerides, lipoprotein (a), apolipoprotein A1 and B, and lipoprotein-associated phospholipase A2), as well as fasting glucose (Rodríguez Perón, 2021).

The Framingham Risk Score (FRS) is a widely used tool for assessing cardiovascular risk, typically estimated over a 10-year period. It takes into account various risk factors such as age, gender, blood pressure, total cholesterol, HDL cholesterol ("good" cholesterol), smoking, and diabetes presence.

To compute risk scores for both men and women, refer to the steps outlined in Table 1.

Table 1: Details of the cardiac risk assessment process.

Risk Factors	**For Men**	**For Women**
Age:	The individual's age in years	
Total Cholesterol:	Level of total cholesterol in mg/dL.	
HDL Cholesterol	HDL cholesterol level in mg/dL.	
Systolic Blood Pressure	Systolic blood pressure in mmHg.	
Smoking:	Enter 1 if the person has diabetes and 0 if not.	
Diabetes	Enter 1 if the person has diabetes and 0 if not.	
Hormone Replacement Therapy (for postmenopausal women)	-	Enter 1 if the person has diabetes and 0 if not.

Source: Authors

Each of these factors is scored based on specific Framingham scoring tables, and individual scores are summed to calculate the Framingham Risk Score. (https://www.mdcalc.com/calc/38/framingham-risk-score-hard-coronary-heart-disease)

It's important to note that the Framingham Risk Score is only an estimate of cardiovascular risk and should not be considered a definitive medical diagnosis. It is used as a screening tool to help healthcare professionals identify individuals at higher risk of developing heart diseases and guide appropriate prevention and treatment.

To evaluate the Framingham Risk Score, criteria were utilized to classify individuals into distinct risk categories, as detailed in Table 2. Please refer to Table 2 for the cardiac risk assessment criteria."

Table 2: Cardiac Risk Assessment Criteria

Level of Risk	For Men	For Women
Low Risk	FRS < 5 in both men and women	
Intermediate Risk	FRS between 5 and < 20%.	
High Risk*	FRS > 20%	FRS > 15%
Very High Risk	Individuals with significant atherosclerosis in coronary, cerebrovascular, or peripheral vascular (>50% obstruction), whether or not they exhibit clinical symptoms.	

* individuals with subclinical atherosclerosis, abdominal aortic aneurysm, chronic kidney disease (CKD), high LDL.

Source: Authors

Statistical Analysis

The data were organized and managed using Microsoft Office Excel® 2016. Afterward, Descriptive Statistics were conducted to characterize the sample population under study. Measures of central tendency and dispersion were employed to summarize the collected data, following guidance from relevant literature sources (Triola, 2018).

Subsequently, the normality of the collected data was assessed using the Shapiro-Wilk test. This assessment informed the choice of statistical tests, with the Single-Factor ANOVA test selected for independent parametric samples and the Kruskal-Wallis test chosen for independent non-parametric samples.

Significance Level and Experiment Power

This study, in order to maintain the scientific rigor of the research, adopted a significance level of $p < 0.05$, meaning a 95% probability that the statements made during the investigations are correct or incorrect (Type I error α), thus allowing for a 5% chance of obtaining results by chance. The experiment's power (Type II error β) was evaluated, allowing for an acceptance level corresponding to 80%. All statements were limited to the study in question, depending on the level of acceptance for the entire population, as indicated by the experiment's power.

Results

The sample consisted of 76 participants residing in the city of Aracaju, Sergipe, with an average age of $\bar{X}$ = 67.76 ± 5.65 years, ranging from a minimum of 48 to a maximum of 85 years. Among them, there were 66 women and 10 men. The clinical characteristics are outlined in Table 3.

Table 3: Identification of the study sample.

	Group	N (number)	% (percentage)
Gender	Female	66	86.%
	Male	10	13.1%
Age	< 60	2	2.6%
	60 a 64	20	26.3%
	65 a 69	32	42.1%
	70 a 74	12	15.7%
	75 a 79	5	6.5%
	80 a 85	5	6.5%

To assess the cardiovascular risk in elderly individuals, the Framingham Risk Score was used, which involves the evaluation of risk factors, including age, gender, blood pressure, cholesterol levels, smoking, and diabetes mellitus. Each of these factors is weighted based on its relative impact on cardiovascular risk. The resulting values are summed to produce a total score, which is then used to categorize an individual's risk. (Table 4 and 5).

Table 4: *Risk factors for man.*

Risk Factor	Mean	Standard Deviation	Scoring	FRS
Age	68.7	5.24	68.7	23.3±3.5 (High Risk)
Total Cholesterol	198.4	27.3	198.4	
HDL Cholesterol	66.4	24.9	66.4	
Systolic Blood Pressure	123.2	10.7	123.2	
Smoking	0.75	0.3	0.75	
Diabetes	0.44	0.2	0.44	

Table 4: *Risk factors for woman.*

Risk Factor	Mean	Standard Deviation	Scoring	FRS
Age	65.7	6.4	65.7	13.8±2.4 (Intermediate Risk)
Total Cholesterol	187.3	27.3	187.3	
HDL Cholesterol	64.2	24.9	64.2	
Systolic Blood Pressure	120.6	10.7	120.6	

Smoking	0.07	0.3	0.07	
Diabetes	0.34	0.4	0.34	
Hormone Replacement Therapy	0.82	0.2	0.82	

The table 5 shows the variance of the data in descriptive statistics for p.

Table 3: P-value of the samples based on Analysis of Variance (ANOVA).

Group	Man	Woman	Δ%	p-value
Age	68.7±5.24	65.7±6.4	4.4%	0.008
Systolic Blood Pressure	123.2 ±10.7	120.6±10.7	2.1%	0.004*
Diastolic Blood Pressure	80.04±11.3	81.04±13.3	1.3%	0.072
Total Cholesterol	198.4 ± 27.3	187.3±27.3	5.6%	0.002*
Cardiac Risk	23.3±3.5	13.8±2.4	40.*%	>0.001*

*statistically significant difference

Source: Data from the research in this study.

Discussion:

Cardiovascular diseases remain the leading cause of morbidity, mortality, and significant healthcare expenditures. Furthermore, it is widely acknowledged that physical exercise improves cardiorespiratory fitness and is considered the primary non-pharmacological intervention, in conjunction with lifestyle changes, for various chronic diseases, particularly cardiovascular conditions (Wu et al., 2019). Consequently, the current study's objective was to evaluate potential cardiovascular risks among an elderly population actively participating in regular physical activities at the University Tiradentes gym**.**

In this context, the Framingham Risk Score (FRS) should be highlighted as a useful and easy-to-use tool, which is why it was employed in this research. By using risk factors for the aforementioned diseases, it classifies individuals into low, moderate, and high risk categories for developing cardiovascular disease over the next ten years, based on a score that helps guide therapeutic approaches (TRIMARCO et al, 2022).

Across the 15 articles analyzed, it becomes evident that all indicators used in the Framingham score do indeed increase the chances of cardiovascular events, although

variations in the prevalence of some indicators as primary contributors to increased cardiovascular risk are observed in each study. Firstly, let's discuss blood pressure. The higher the blood pressure, the greater the pressure inside the arteries, which impairs blood circulation, directly impacting the heart's workload. Secondly, we can address total cholesterol and HDL cholesterol. The former can deposit in the artery walls, forming plaques that increase the risk of obstruction and, consequently, heart attacks and strokes, while the latter collects accumulated cholesterol in blood vessels to eliminate it through the liver.

Next, we can discuss age as a risk factor: due to the increased cardiovascular risk with aging and the inherent changes associated with it, such as increased arterial stiffness, greater peripheral vascular resistance, comorbidities, and elevated blood pressure, which can affect around 60% of the elderly, according to National Health Survey data. Additionally, we must mention diabetes, a highly prevalent chronic disease among the elderly, which can lead to increased blood clot production, further obstructing arteries. Lastly, smoking is a risk factor as it also causes alterations in arteries.

Furthermore, it's essential to mention that there are other important factors for this assessment. Therefore, in our study, we conducted an anamnesis to collect information such as income, address, educational level, marital status, activities performed, duration of activities, family history, and alcohol consumption. However, the factor that stands out the most is physical activity, as it influences all the others. Among the 15 articles analyzed, 8 emphasized that in recent years, non-pharmacological approaches such as promoting exercise programs and proper nutrition have become low-cost, low-risk strategies capable of contributing to blood pressure regulation, treatment of dyslipidemia, and obesity. Thus, they regulate the cardiovascular risk level, as seen in this study. However, the reduction of risks seems to be linked to dedication, availability, and adherence to the exercise program.

These advantages stem from functional responses to heightened energy requirements during exercise and enduring chronic adjustments. The latter is regarded as a prominent characteristic of prolonged exercise, which involves structured, well-planned, and repetitive physical activity. The intermittent hemodynamic stimuli induced by training foster physiological cardiac hypertrophy while also enhancing vascular

structure (angiogenesis) and function. These changes contribute to elevated cardiac output and a decreased risk of atherosclerosis. (Wu et al., 2019).

In this way, the reason for the positive results in our study regarding cardiovascular risk becomes evident. In other studies conducted to analyze cardiovascular risk, a higher prevalence of low cardiovascular risk was also observed. For example, in a sample of hypertensive Brazilians, predominantly elderly, it was observed that 74% had low, 14% moderate, and 12% high cardiovascular risk (TRIMARCO et al, 2022).

However, some limitations should be noted in this study, such as the significant difference in the number of female and male participants. It is known that gender can also be relevant when assessing cardiovascular risk. For example, men tend to pay less attention to their health compared to women, which would increase the total cardiovascular risk value of the population. On the other hand, women in menopause, due to low estrogen levels, also have an increased risk. Furthermore, due to its cross-sectional design, the study couldn't track future outcomes as is possible in longitudinal studies.

Conclusion

The study aimed to investigate gender differences in key cardiovascular indicators, focusing on systolic blood pressure, total cholesterol, and cardiac risk. The results revealed statistically significant differences between men and women in these parameters. Systolic blood pressure was found to be higher in men (123.2 ± 10.7) compared to women (120.6 ± 10.7), with a statistically significant difference of 2.1% ($p = 0.004$). Similarly, total cholesterol levels were significantly elevated in men (198.4 ± 27.3) compared to women (187.3 ± 27.3), showing a difference of 5.6% ($p = 0.002$). The cardiac risk, as assessed by a composite score, was markedly higher in men (23.3 ± 3.5) compared to women (13.8 ± 2.4), indicating a substantial difference of 40% ($p < 0.001$). These findings underscore the importance of considering gender-specific cardiovascular risk factors and tailoring preventive strategies accordingly.

The main findings highlight that a substantial proportion of these women have high blood pressure, unfavorable cholesterol levels, and unhealthy body composition. This points to the urgent need for effective intervention to mitigate risk factors and improve the cardiovascular health of this population.

The outcome of this study underscores the importance of personalized preventive strategies and the implementation of awareness measures regarding cardiovascular health in UBS. By recognizing these risk factors and implementing educational and healthy lifestyle programs, we can aspire to a significant improvement in heart health and the quality of life of these elderly women.

In summary, this study provides an in-depth and informed insight into the cardiovascular status of UBS attendees in Aracaju, Sergipe, and highlights the urgency of a holistic approach to cardiovascular health promotion. Understanding these risk factors and applying effective strategies are essential to successfully address this public health challenge and contribute to the lasting well-being of elderly women.

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