Epidemiological analysis of cardiac risk factors in elderly people[1]

Análise epidemiológica dos fatores de risco cardíaco em idosos

Análisis epidemiológico de los factores de riesgo cardíaco en personas mayores

[Artículos]

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Resumo

Este estudo analisou fatores de risco cardíaco em idosos, ressaltando o aumento da incidência de doenças cardiovasculares com o avanço da idade. Foram avaliados 372 idosos em Unidades

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Básicas de Saúde, divididos em grupos sedentários e ativos. A pesquisa destacou a importância da atividade física na redução do risco cardiovascular, utilizando o Escore de Framingham para identificar alto risco cardiovascular e direcionar intervenções. A análise sociodemográfica incluiu faixa etária, etnia, estado civil, educação, renda e histórico familiar de doenças. Inferências Bayesianas foram realizadas para avaliar o número de alterações simultâneas nas variáveis e calcular a proporção de indivíduos potencialmente com riscos cardíacos (Potenciais Cardiopatas). A conclusão final das inferências Bayesianas indica que aproximadamente 29,0% dos indivíduos na amostra podem ser considerados potencialmente cardiopatas devido a duas ou mais alterações nas variáveis avaliadas.

Palavras-chave: doenças cardiovasculares, exercícios físicos, fatores de risco, idoso.

Resumen

Este estudio analizó factores de riesgo cardíaco en personas mayores, resaltando el aumento de la incidencia de enfermedades cardiovasculares con el avance de la edad. Se evaluaron 372 adultos mayores en Unidades Básicas de Salud, divididos en grupos sedentarios y activos. La investigación destacó la importancia de la actividad física en la reducción del riesgo cardiovascular, utilizando el Puntaje de Framingham para identificar alto riesgo cardiovascular y dirigir intervenciones. El análisis sociodemográfico incluyó el rango de edad, etnia, estado civil, educación, ingresos y antecedentes familiares de enfermedades. Se realizaron inferencias bayesianas para evaluar el número de cambios simultáneos en las variables y calcular la proporción de individuos potencialmente con riesgos cardíacos (Potenciales Cardiópatas). La conclusión final de las inferencias bayesianas indica que aproximadamente el 29,0% de los individuos en la muestra pueden considerarse potencialmente cardiópatas debido a dos o más cambios en las variables evaluadas.

Palabras clave: adulto mayor, ejercicios físicos, enfermedades cardiovasculares, factores de riesgo.

Abstract

This study analyzed cardiac risk factors found in older adults, highlighting the increased incidence of cardiovascular diseases with advancing age. A total of 372 elderly individuals were evaluated at Basic Health Units, and divided into sedentary and active groups. Research emphasized the importance of physical activity in reducing cardiovascular risk, using the Framingham Score to identify high cardiovascular risk and to guide interventions. The sociodemographic analysis included age group, ethnicity, marital status, education, income, and family history of diseases. Bayesian inferences were conducted to assess the number of simultaneous changes in variables and calculate the proportion of individuals with potential cardiac risk. The final conclusion of Bayesian inferences indicates that approximately 29.0% of individuals in the sample may bear potential cardiovascular risk due to two or more alterations in the evaluated variables.

Keywords: cardiovascular diseases, elderly, physical exercises, risk factors.

Introduction

Cardiac risk is a concern for older people, as aging is associated with a higher incidence of cardiovascular disease (Matos *et al*., 2021). When confronting this problem, physical conditioning can reduce the risk of heart disease, hypertension, atherosclerosis, cardiac arrhythmias and heart failure, among other pathologies related to the cardiovascular system (Inácio, 2020).

Elderly people who maintain an adequate level of physical activity have a lower risk of developing cardiovascular disease. Physical exercise can improve cardiovascular health, blood pressure, heart rate and serum cholesterol levels (Inácio, 2020).

There are several risk factors that can contribute to the development of cardiovascular diseases (CVDs), including some that can be modified, such as dyslipidemia, diabetes mellitus, arterial hypertension, obesity, sedentary lifestyle, smoking and alcohol consumption (Dos Santos & Rezende, 2022). Non-modifiable risk factors such as age, sex and family history can interact and increase the risk of developing cardiovascular pathologies like coronary artery disease, heart failure and other vascular complications. All these factors can combine and interact in complex ways to increase the overall risk of CVDs (Cabral, 2019).

A subject's fitness level can be assessed using stress tests that measure the ability of the heart and lungs to supply oxygen to the body during exercise. Elderly people in good physical condition tend to have a stronger heart and more efficient blood circulation, which reduces the risk of cardiovascular disease (Cunha *et al.*, 2023).

One of the most common indicators for assessing cardiac risk in the elderly is the Framingham Risk Score (FRS). This score takes into account factors such as age, sex, blood pressure, cholesterol levels, smoking and diabetes to estimate the risk of developing cardiovascular diseases in the next 10 years (Dos Santos & Rezende, 2022).

In addition to the FRS, there are other indicators that can be used to assess cardiac risk in older people, including heart rate and blood pressure at rest and during exercise, and the presence of symptoms such as chest pain during exercise (Dos Santos & Rezende, 2022). It is important to emphasize that cardiac risk is influenced by several factors, and the assessment must be made individually, taking into account the medical history and health conditions of each person (Forest *et al.*, 2022).

Physical fitness is not the only factor influencing cardiac risk in older people. Factors such as a family history of heart disease, smoking, an unhealthy diet, and a sedentary lifestyle must also be taken into account.

Cardiovascular and aerobic fitness are closely related to cardiovascular training. Exercise is considered the fundamental basis of physical activity, because the greater the individual's aerobic capacity, the more efficiently the heart, lungs and blood vessels will be able to transport oxygen throughout the body, which facilitates the performance of daily activities (Jacomini, 2022).

Under this adaptation, the training load is adjusted based on the residual training effect, which is the time after training in which physiological adaptations remain in the body. The cardiovascular system adapts to training demands, and this adaptation is reflected in changes in resting heart rate, recovery capacity after exercise, and overall efficiency of the cardiovascular system (Takahashi, 2018).

Unfortunately, genetic risk factors for cardiovascular disease are unalterable. It is essential to take preventive care of cardiovascular health, especially in old age, due to the persistence and severity of some immutable risk factors (Marques Junior, 2023).

The low takeup of exercise among older adults can be variously attributed to the lack of knowledge about its importance in the prevention of chronic diseases and the lack of time during the day (Matos *et al*., 2021). However, physical inactivity accelerates functional decline, leading to greater disability, loss of quality of life and increased disease and mortality. Elderly people who participate in prevention programs and adopt lifestyle changes can minimize these risk factors (Nóbrega, 2020).

In light of this, maximal oxygen consumption (VO_{2max}) is an important indicator of an individual's cardiorespiratory capacity, that is, how efficiently the body can use oxygen during exercise. As people age, there is a reduction in VO_{2max}. This is, in part, due to physiological changes that affect the body's ability to use oxygen effectively. However, it, may also be related to a less active lifestyle as people age (Vieira, 2021).

Practicing efficient physical activity provides a series of benefits to health and well-being. It delays the physical and psychological aging process, improves motor skills and promotes higher quality sleep. In addition, it can reduce anxiety (Oliveira Corrêa *et al*., 2020).

Aerobic activity, such as regular walks, are safe and help maintain cardiorespiratory fitness in older adults, promoting a better quality of life (Pohl *et al.*, 2018).

These exercises can also prevent cardiovascular disease by decreasing the formation of atherosclerotic plaques and eventual blockages. In addition, at higher intensities and in the long term, aerobic exercises can improve lipid profile, increasing HDL cholesterol and reducing LDL cholesterol levels in obese people (Oliveira, 2013).

A sedentary lifestyle, inadequate nutrition, the presence of pre-existing diseases, and the lack of guidance on the importance of controlling these cardiovascular predictors are linked to increased heart rate (HR) and respiratory rate (RR) (Silva, 2021).

Weight training can lead to a reduction in blood pressure levels, without the use of medications. This is especially relevant, as high blood pressure is an important risk factor for cardiovascular disease (Silva, 2022).

Therefore, physical exercises bring a panoply of benefits to the elderly in several spheres, includingmorphological and neuromuscular, as well as cardiorespiratory (Sousa *et al.*, 2021). In addition to preventing some age-related diseases, regular physical activity can help treat a number of other conditions acquired with aging, such as cardiovascular disease.

Physical exercise not only brings direct benefits to cardiovascular health in the elderly, but also contributes to the maintenance of physical, cognitive and social function. The regular practice of exercise is an effective strategy to mitigate the effects of aging on organic functions and significantly reduce the risk of cardiovascular problems, resulting in a healthier and more active life in old age (Vilela Junior *et al*., 2022).

In consideration of the above, this research aims to carry out an epidemiological analysis of cardiac risk factors in the elderly.

Methodology

The study in question will follow a quantitative, descriptive, and correlational approach.

The scope of the research is based on elderly people , that ages range from 60 to 85 years old, assisted by the Basic Health Units (UBS) in different neighborhoods of the city of Aracaju, including Aeroporto, Atalaia, Castelo Branco, Coroa do Meio, Farolândia, Grageru, Inácio Barbosa, Jabotiana and Ponto Novo. The UBS covered by the study are: 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 of Calcutta and UBS Manoel de Souza Pereira. The elderly population of Aracaju represents approximately 14,000 individuals.

Participants were selected at the UBS by invitation after a preliminary lecture held at Campus Farolândia. Volunteer requirements included age greater than 60 and a commitment to participating in a physical exercise program. Those with motor limitations or comorbidities that prevent participation in exercise programs were not permitted to participate.

The study met the requirements of Resolution 466/12, of the National Health Council, of December 12, 2012, which deals with the norms for carrying out Research on Human Beings.

Each UBS received a Term of Information to the Institution - TII, specifying all procedures, risks and precautions.

Each volunteer participant expressed their acquiescence by signing the Free and Informed Consent Form (TCLE), with the same information as the TII and with clear discussion of the risks and benefits of study participation; including social relevance of the research and advantages to the study subjects themselves.

The research was approved by the Ethics Committee in Research with Human Beings of Tiradentes University on March 26, 2020, according to opinion nº 3.936.886 - CAAE: 26524719.4.0000.5371.

39 elderly people from the UBS of Farolândia, Augusto Franco and Orlando Dantas were considered in a pilot study to calculate the sample size needed for statistical significance. A 95% confidence interval was established. The calculated sample size was 220 elderly people, with an increase of 10% to compensate for any losses, totaling 242 elderly people. This allowed obtaining significant and representative results of the functional characteristics.

For cardiovascular analysis, the choice of Framingham Risk Score (FRS) as the method of assessing cardiovascular risk in the project is supported by the fact that it has been tested and validated in different populations, including studies carried out in Brazil. The Ministry of Health recommends the use of the FRS due to its effectiveness and ability to provide useful information on individual risk of cardiovascular disease.

By using the FRS, it will be possible to identify study participants who have a higher cardiovascular risk and design appropriate intervention strategies, such as physical exercise programs and guidance on a healthy lifestyle. In addition, the periodic monitoring of the FRS throughout the study will allow the longitudinal evaluation of the effects of these interventions on individual participants' cardiovascular risk.

The FRS uses several classic risk factors, such as age, gender, blood pressure, cholesterol levels, smoking and diabetes, to calculate the absolute risk of developing cardiovascular disease over the next 10 years. This approach yields the estimated probability of an individual's experiencing cardiovascular events, such as myocardial infarction, stroke, or peripheral arterial disease.

For the treatment of the collected data, initially, the Shapiro-Wilk test was performed to verify if the collected data have a Gaussian distribution and the Levene test was used to evaluate the homogeneity of the collected data.

Based on these procedures, statistical methods were determined as parametric (for distributions close to normality) or non-parametric.

In describing the collected data, location measures and dispersion measures were used. Among the former, the average was calculated as a measure of central tendency. Dispersion measures estimate the variability in the data. For this purpose, the standard deviation and the minimum and maximum values were verified. In addition to these measures, absolute and relative frequency measures were used.

The inferential statistic tests used will be Pearson's Correlation Test or Spearman's Correlation Coefficient, depending on whether the variables are parametric or non-parametric, respectively.

Results

Information was collected on household and sports activities carried out by individual subjects. The sum of these activities resulted in a total score for each participant, thereby classifying them as sedentary or active.

After collecting the data and obtaining the total scores, the median of these values was analyzed, which was calculated at 1.60. This median was used as a parameter to distinguish between sedentary and active elderly. Those individuals who had a total score less than or equal to 1.60 were classified as sedentary, while those who had a total score above 1.60 were considered active. In the study, 43 sedentary and 45 active older adults were identified based on the criteria above.

The approach allowed identifying and differentiating the elderly in the study based on their levels of physical activity. The results obtained provided important information on the distribution of these activity levels among the analyzed sample population, helping to understand patterns of behavior and to elaborate strategies that promote physical activity among the older population.

The sedentary and active study groups were then divided by gender (female and male) and general information about the sample was analyzed. Each group has data on age, systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), total cholesterol (T-cholesterol), HDL-cholesterol (HDL), LDL-cholesterol (LDL) and random glucose.

Statistical measures included the following values for each variable: minimum, maximum, median, mean, and standard deviation (SD).

Blood pressure (BP), heart rate (HR), total cholesterol (Col.Tot), HDL, LDL and glucose levels were classified as "Not Evaluated", "Changed" or "Not Changed". The distribution of changes for each variable was also provided.

Bayesian inferences were performed to assess the number of simultaneous changes in the variables and the proportion of individuals potentially at cardiac risk (Potential Cardiopathies).

The total sample (GENERAL) includes 75 individuals. The female sample includes 61 individuals, and the male sample includes 14 individuals. Variables analyzed include age, blood pressure, heart rate, total cholesterol, HDL, LDL and blood glucose. Mean, median, and standard deviation values are provided for each variable. Blood pressure, heart rate, total cholesterol, HDL, LDL and blood glucose values were categorized as "Not Evaluated", "Changed" or "Not Changed". Bayesian inferences extrapolated changes in variables and calculated the proportion of individuals with potential cardiac risk. The final conclusion of the Bayesian inference indicated that approximately 29.00% of the individuals in the sample can be considered at potential cardiac risk, due to two or more alterations in the evaluated variables.

Finally, it is essential to explain the cross table Physical Activity Level ($X \leq 1.6$ or $X > 1.6$) x Cardiac Risk (as or without), in order to better visualize the gains from physical activity. As shown below:

Table 1 – Physical Activity Level and Cardiac Risk

	Physical Activity Level ($X \leq 1,6$)	Physical Activity level ($X > 1,6$)
Cardiac Risk	Yes	No
Not Evolueted	0	30
Evolueted	45	45
Minimum	60	95
Maximum	85	187
Median	67	121
Average	67,9	124,8
Standard deviation	5,6	19,9

Source: Own elaboration.

This table shows the average values related to the level of physical activity ($X \leq 1.6$ or $X > 1.6$) and cardiac risk (Yes or No). The crosstab relates the level of physical activity (divided into lower and higher) with cardiac risk (present or absent). The data shows average health parameters for the following groups: for the group with the lowest physical activity, the average age is 67.9 years, and the average values for blood pressure, cholesterol and glycemia are

higher. And for the group with the most physical activity, the average age and health parameters are similar to the group with the least physical activity. This analysis seeks to understand how physical activity is associated with health indicators in the elderly population, indicating that despite some differences in mean values, both physical activities have a certain similarity in results.

Sample characteristics

The sample characteristics will first be presented in a frequency distribution of different socioeconomic variables. A sociodemographic study will be demonstrated, covering data collected from 372 participants, with the aim of better understanding their composition and behaviors, as shown in the following table:

Table 2 - Sociodemographic Data

SOCIODEMOGRAPHIC DATA	n = 372	
AGE GROUP	**No**	**%**
60 – 69 years old	240	64.51
70 – 79 years old	120	32.26
80 or older	12	3.23
ETHNICITY		
White	132	35.48
Black	48	12.90
Brown	192	51.62
MARITAL STATUS		
Single	168	45.16
Married	120	32.26
Widowed	84	22.58
EDUCATION		
StudiedNo Schooling / Incomplete Elementary School	120	32.26
Primary Education Completed	84	22.58
High School Completed	132	35.48
Higher Education Completed	36	9.68

DAILY ACTIVITY		
Family caregiving	156	41.94
Formal work / family	96	35.48
Retired	132	22.58
MONTHLY FAMILY INCOME		
Up to 2X minimum wage	216	58.06
2 to 4X	60	16.13
4 to 10X	12	3.23
Prefer not to say	84	22.58
HISTORY OF CHRONIC DISEASES IN THE FAMILY		
Yes	288	77.42
No	84	22.58
PRE-EXISTING CHRONIC DISEASES AND USE OF PRESCRIPTION MEDICATION		
Have illnesses or use prescription medication	324	87.10
No chronic disease or prescription medications	48	12.90
STRESS SELF-CONTROL		
Poor / Bad	72	19.35
Average	168	45.17
Good / Excellent	132	35.48
SMOKER		
Nonsmoker	348	93.55
Up to 10 cigarettes/day	24	6.45
ALCOHOLIC DRINKS/WEEK		
Nondrinker	312	83.87
Up to 5 per week	60	16.13
From 5 to 9 per week	0	0.00

Source: Own elaboration.

This sociodemographic study analyzed data from 372 participants across multiple categories. The predominant age group was 60 to 69 years old (64.51%), followed by 70 to 79 years old (32.26%). The most represented ethnicity was brown (51.62%), followed by white (35.48%) and black (12.90%). Most participants were single (45.16%) and had completed high school (35.48%). Most took care of the family (41.94%) and had a family income of up to 2X minimum wage (58.06%). The majority had a history of chronic diseases in the family (77.42%) and had chronic diseases or used prescription drugs (87.10%). The majority of participants were classified, according to their personal control of stress, as average (45.17%), did not smoke (93.55%) and did not consume alcoholic beverages (83.87%).

Conclusion

This research addressed the global concern of cardiovascular diseases in the older population, considering aging as a risk factor for these conditions. Physical fitness clearly plays a crucial role in reducing the risk of heart disease.

Regular physical activity has been identified as an effective means of improving cardiovascular health, blood pressure, heart rate and cholesterol levels. Modifiable risk factors, such as dyslipidemia, diabetes, hypertension, obesity, smoking and alcohol consumption also place a heavy influence on the development of cardiovascular diseases.

The proposed study aimed to carry out an epidemiological analysis of cardiac risk factors in elderly people. The analysis of the sample revealed the presence of different risk factors and identified a significant proportion of elderly people potentially suffering from heart disease.

The characteristics of the sociodemographic sample revealed information about age group, ethnicity, marital status, education, daily activity, family income, and family history of chronic diseases. It was possible to identify groups with greater and lesser cardiac risk. These findings are relevant to programs of early identification and intervention to reduce the risks of cardiovascular diseases in the elderly.

Additionally, our finding that a significant cohort of the participants were sedentary underscores the need for strategies and interventions aimed at improving the level of physical activity in this population, encouraging the adoption of a more active and healthy lifestyle.

The results indicated the need to promote physical activity among the elderly and implement intervention strategies to reduce cardiovascular risk factors in this population. In

addition, the research reinforced the importance of an individualized approach in assessing cardiac risk, considering each person's medical history and health conditions.

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