ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND CARDIOVASCULAR RISK FACTORS IN INDIVIDUALS UNDERGOING CARDIAC REHABILITATION PROGRAM

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ABSTRACT

Introduction: Physical activity (PA) practice presents an inverse relation with risk factors (RF) of cardiovascular disease, with positive effects in quality of life and other physical and psychological variables. However, the benefits of daily activities have not been established. Objective: To investigate the prevalence and association of cardiovascular risk factors and physical activity in different categories of patients under a cardiac rehabilitation program. Methods: 69 participants of a cardiac rehabilitation program were evaluated and weight, height and blood pressure were checked. Afterwards, the patients answered questionnaires to assess self-reported physical activity level, stress level and verify the presence of RF. Logistic regression was used to estimate odds ratio. Results: High prevalence of RF was found in the subjects, age and hypertension were more prevalent while smoking and stress had lower prevalence. Most individuals were classified as sedentary, except for locomotion PA (LPA). Conclusion: That there is high prevalence of RF in patients attending cardiac rehabilitation programs, while sedentary ones are more likely to have the RF hypertension, obesity, smoking, alcohol and stress than the active ones, depending on the PA category.

Keywords: risk factors, motor activity, rehabilitation.

INTRODUCTION

The cardiovascular diseases (CVD) play an unquestionable role in the morbidity and mortality of the western world[1,2] and risk factors (RF) predispose their development. These factors can be divided in two categories: the changeable ones (environmental and behavior), such as smoking, high serum cholesterol, systemic arterial hypertension, physical inactivity, diabetes, obesity and stress; and the unchangeable ones (genetic and biological), for example: heredity, sex and age[2,3].

Studies have shown high prevalence of individuals with at least one RF[2,4], which highlights the multifactorial origin of the CVD and reinforces the need of implementation of actions which aim at health promotion, as well as prevention of these diseases[3,5]. Among the RF, we can mention sedentarism, which, in Brazil, according to the Brazilian Institute of Geography and Statistics, affects about 80.8% of the adults and its association with other RF may lead to the development of CVD[6].

On the other hand, regular practice of physical activity presents an inverse relation with CVD risk and presents positive effect in the quality of life and other physical and psychological variables[7,8]. Moreover, the literature mentions that activities of daily living such as walking for over 30 minutes and climbing up stairs, both of occupational and free time nature, may result in cardiovascular protection[9] and, besides that, occupational activities with higher energetic expenditure are associated with lower rates of death by CVD.

In CVD patients included in cardiac rehabilitation programs,

the benefits of regular physical activity on the RF[8,10,11] are well-consolidated. However, the literature presents a gap concerning the influence of occupational and of daily living activities on this aspect in this population. Studies of this nature may be an important help for researchers and health professional who work in cardiac rehabilitation programs in the design of strategies for change in life style of this population.

Thus, the study had the aim to investigate the prevalence and association of cardiovascular RF and levels of physical activity in different categories in patients of a cardiac rehabilitation program.

METHODS

Sample

The sample of the study was composed of 69 patients; 49 men and 27 women aged 67.18 ± 9.23 years, all of them patients of the cardiovascular rehabilitation sector of the Studies and Assistance Center in Physiotherapy and Rehabilitation (CEAFIR) of the Sciences and Technology School – FCT/UNESP – Presidente Prudente Campus.

Volunteers who presented comprehension deficit about the applied questionnaires, as well as those who did not agree to answer them, were not included in the study.

Ethical aspects

The volunteers were accordingly informed about the procedures and aims of this study, and after having agreed, they signed a Free and Clarified Consent Form. All procedures used were approved by

the Ethics Committee in Research of the Sciences and Technology School – FCT/UNESP (proc. nº 96/2010) and followed the Resolution 196/96 of the National Health Board from 10/10/1996.

Data collection

The data collections were performed at the CEAFIR between September and November, 2010 and the patients were approached before the rehabilitation session started.

Initially, each individual had his/her anthropometric measures and blood pressure checked. The patients were told to wear light clothes for weight and height measurement, which were taken on a digital electronic scale (Welmy R/I 200 – Brazil) and with a stadiometer (Sanny – Brazil). Blood pressure was indirectly checked with na aneroid sphigmomanometer (Welch Alyn – Tycos, New York, USA), previously calibrated, and a stethoscope (Littmann, Saint Paul, USA) according to recommendations from the V Brazilian Hypertension Guidelines[12].

After these procedures, the patients answered the self-reported questionnaires proposed in the study in order to have the physical activity level an stress level evaluated and presence of RF verified. These questionnaires were applied by a trained team.

Risk factors analyzed

The following risk factors were analyzed for this investigation: arterial hypertension, age, obesity, *diabetes mellitus*, total cholesterol, triglycerides, smoking, alcoholism and stress.

The characterization of age as a RF, followed the criteria established by the American College of Medicine Science, being considered RF values above 45 for men and 55 years old for women.

Values above or equal 140/90 mmHg and the individuals who presented blood pressure values below these levels but refer use of anti-hypertensive drugs or presented medical diagnosis were considered positive for arterial hypertension[3]. In order to evaluate obesity, the body mass index (BMI) was used and the individuals who presented BMI values above 30 kg/m² were considered obese[13].

The presence of *diabetes mellitus*, total cholesterol, triglycerides, smoking and alcohol was determined through a questionnaire. Individuals who self-declared have been smokers for over one year and daily ingested alcohol were considered positive for these factors. *Diabetes mellitus*, total cholesterol and triglycerides were considered present when the subjects had medical diagnosis of such factors and/or made use of medication specific to these conditions[2,4,5].

In order to assess the presence of stress, the inventory of stress symptoms by Lipp (ISSL) was used[14]. It is an investigation instrument validated in Brazil[15] which presents four levels of stress, initially based on the three-phase model by Selye, which identifies the phases alert, resistance, almost-exhaustion and exhaustion[14]. Individuals who presented symptoms in the almost-exhaustion and/or exhaustion phase were considered positive for this risk factor[14,15].

Level of physical activity

The level of physical activity was determined through the Baecke questionnaire[16], which was validated and its reproducibility accepted

for evaluation of habitual physical activity in adult men[17] and elderly men[18], being hence used in the literature for determination of the level of physical activity in different populations.

The questionnaire has as reference period the last 12 months and it comprises 16 questions, which are distributed in three distinct sections: 1) occupational physical activities (OPA); 2) free-time physical activities (FTPA); and 3) leisure and locomotion physical activities (LPA)[16-18].

In order to determine the association between the levels of physical activity and the RF in each category and for the total score, the volunteers were sorted out in two groups (active or sedentary) taking in consideration the value of the mean of each score.

Statistical analysis

Descriptive statistics was performed for characterization of the studied sample and the results were presented as mean, standard deviation, absolute numbers and relative numbers values.

In order to analyze the scores of the questionnaire between the sedentary and active groups of the categories in it, data normality was initially tested through application of the Shapiro-Wilk test. Whenever data were normal, comparison was made with the application of the non-paired Student's *t* test with significance level of 5%.

The odds ratio test with confidence interval of 95% was used for analysis of the chance the active and sedentary groups had to present cardiovascular risk factors.

RESULTS

The anthropometric variables and the blood pressure and heart rate values of the studied patients are presented in table 1.

Table 1. Mean values, followed by their respective standard deviations, of the anthropometric data and cardiovascular parameters of the studied population (n = 69).

Age (years)	67.18 ± 9.23
Weight (kg)	79.93 ± 14.77
Height (m)	1.64 ± 0.08
BMI (kg/m²)	29.62 ± 4.85
SBP (mmHg)	125 ± 18
DBP (mmHg)	72 ± 7
HR (bpm)	76.54 ± 10.15

BMI – body mass index; SBP – systolic blood pressure; DBP – diastolic blood pressure; HR – heart rate.

Table 2 presents the distribution of prevalence, in percentage and absolute values, of the risk factors of the total population analyzed and separated in active and sedentary. It is observed that the risk factors age and arterial hypertension were the most prevalent, while smoking and stress presented lower prevalence.

The individuals distribution according to each category of physical activity, total and separated in active and sedentary, and the score of each level of the Baecke questionnaire is presented in table 3. The majority of the individuals were classified as sedentary, except for the LPA. The scores of all categories present statistically significant difference between the sedentary and active levels.

The association between sedentary and active in each PA category and the occurrence of the studied RF is presented in tables 4. It is observed in all PA categories that the sedentary individuals are most likely to present the RF alcohol ingestion than the active ones. Sedentary individuals also present more chance than the active ones to present arterial hypertension in the OPA category, smoking in FRPA, arterial hypertension, obesity and smoking in LPA and stress in the TPA category.

The active individuals behave more poorly than the sedentary ones; that is to say, they present RF *diabetes mellitus* in the OPA category and cholesterol in the FTPA and TPA categories.

Table 2. Prevalence of the risk factors in patients participants in the cardiovascular rehabilitation program, expressed in absolute and percentage values.

Risk factors	Prevalence		
	Sedentary	Active	Total
Arterial hypertension	31 (81.5%)	26 (83.8%)	57 (82.6%)
Age	38 (100%)	29 (76.3%)	66 (95.7%)
Obesity	14 (36.8%)	15 (39.4%)	29 (42.1%)
Diabetes mellitus	11 (28.9%)	8 (21.0%)	19 (27.5%)
Cholesterol	8 (21.0%)	14 (36.8%)	22 (31.9%)
Triglycerides	5 (13.1%)	6 (15.7%)	11 (15.9%)
Smoking	1 (2.6%)	3 (9.6%)	4 (5.8%)
Alcoholism	21 (55.2%)	13 (34.2%)	34 (49.3%)
Stress	3 (7.8%)	2 (5.2%)	5 (7.3%)

Table 3. Distribution of the level of physical activity according to the categories of physical activity of the Baecke Questionnaire, expressed in absolute and percentage values, mean and standard deviation of the scores.

Categories	Sedentary	Active	Total
OPA	43 (62.3%) 0.0 ± 0.0*	26 (37.7%) 2.79 ± 0.69	69 (100%)
FTPA	35 (50.7%) 2.24 ± 0.31*	34 (49.3%) 3.31 ± 0.32	69 (100%)
LPA	29 (42.0%) 1.41 ± 0.23*	40 (58.0%) 2.40 ± 0.50	69 (100%)
TPA	38 (55.1%) 4.49 ± 0.94*	31 (44.9%) 7.31 ± 1.02	69 (100%)

*Value with statistically significant difference concerning the active group (Non-paired Student's t test; p < 0.05); OPA – occupational physical activity; FTPA – free time physical activity; LPA – locomotion physical activity; TPA – total physical activity.

Table 4. Association between the levels of category of physical activity and the risk factors.

Risk factors	Categories of physical activity			
	OPA	FTPA	LPA	TPA
Arterial hypertension	2.90 [0.23-0.82]*	14.60 [0.88-3.58]	3.47 [0.28-0.98]*	4.14 [0.33-1.17]
Obesity	4.53 [0.63-1.69]	3.93 [0.58-1.50]	2.16 [0.31-0.82]*	4.22 [0.61-1.61]
Diabetes mellitus	16.29 [1.86-5.51]*	6.47 [0.76-2.18]	5.39 [0.57-1.75]	8.35 [0.94-2.80]
Cholesterol	8.05 [0.99-2.83]	9.20 [1.08-3.16]*	7.67 [0.85-2.56]	8.85 [1.08-3.09]*
Triglycerides	5.40 [0.40-1.47]	13.64 [0.79-3.28]	5.03 [0.35-1.33]	5.79 [0.43-1.58]
Smoking	55.72 [0.54-5.48]	7.31 [0.13-0.97]*	2.25 [0.02-0.22]*	32.74 [0.32-3.21]
Alcohol	1.34 [0.18-0.49]*	1.75 [0.20-0.59]*	1.74 [0.25-0.66]*	1.52 [0.22-0.58]*
Stress	7.13 [0.17-1.11]	42.83 [0.48-4.53]	29.41 [0.33-1.17]	5.15 [0.13-0.80]*

* Statistically significant difference p < 0.05; Odds ratio; [CI95%]: confidence interval of 95%; OPA – occupational physical activity; FTPA – free time physical activity; LPA – locomotion physical activity; TPA – total physical activity.

DISCUSSION

The main findings of this study show that: 1) the prevalence of risk factors in cardiac patients submitted to a rehabilitation program is high, with age and arterial hypertension presenting higher prevalence and smoking and stress lower prevalence; 2) except for the LPA category, the majority of the individuals was classified as sedentary; 3) the group classified as sedentary presents higher chance than the active group to present arterial hypertension and alcohol ingestion in OPA, smoking and alcohol in FTPA, hypertension, obesity, smoking and alcohol in LPA and alcohol and stress in TPA, while the active group presents more chance than the sedentary group to present diabetes in OPA and cholesterol in FTPA and TPA.

The high prevalence of RF in the individuals analyzed may be related to the characteristics of this population; that is, elderly

subjects and with cardiovascular pathologies. This high prevalence highlights the importance of the cardiac rehabilitation programs as prevention. These programs are privileged places for adoption of prevention strategies[11] and, besides the benefits of the physical exercise on the RF[8], they can offer guidelines which stimulate changes in life style of the patients, making them aware of the importance of prevention of RF.

Educational measures are crucial in order to decrease and/or attenuate the adverse effects of the RF, which may provide reduction of the cardiovascular events as well as increase quality of life[6]. Moreover, high prevalence of RF in this population justifies its regular cardiac follow-up as prevention[19].

In this population, the RF age and arterial hypertension were the most prevalent and smoking and stress the ones with the lowest prevalence. These results partly corroborate the ones described by Bennati et al.[20], who also found in a cardiac rehabilitation program the AH as the most prevalent RF and smoking as the least prevalent.

Concerning the studied categories of physical activity, except for the LPA category, sedentarism was observed in the remaining categories. The OPA level presented high number of sedentary individuals and lower score, which seems to be related to the fact that great part of the participants in the study is retired. Low level of OPA was also observed in elderly women, who did not perform occupational activities and spent great part of the day in the sitting position[21]. Individuals in the age group analyzed in this work spent longer time seated, watching television, sewing, playing cards and few of them walk or cycle[21].

Despite being engaged in cardiac rehabilitation program, 50.7% of the patients were classified as sedentary for FTPA. This level of activity evaluates activities periodically performed, and those performed in the cardiac rehabilitation program, due to their characteristics, were placed in this category. The intensity of the activities developed in the cardiac rehabilitation programs is dependent on the clinical and physical conditions of the patients; therefore, patients with worse clinical conditions and lower physical conditions, perform the activities with low to moderate intensity, which can have influenced the FTPA scores, and guiding the volunteers into being classified as sedentary. Moreover, the majority of the volunteers do not perform any other activity besides the cardiac rehabilitation.

Concerning the LPA, the category which evaluates locomotion analyzing the quantity of time the individual remains seated or walking, and also, the use of a bicycle as means of transportation, the majority of the volunteers were considered active. Such fact can be explained, since this category presents lower score. Thus, despite having been considered active, the individuals present low values of score for locomotion activities.

In the association of the PA levels of each category with the RF, 13 statistically significant associations are observed, and the sedentary individuals are worse than the active ones in 10 of these associations. The sedentary subjects present worse behavior than the active ones for OPA with arterial hypertension and alcohol; for FTPA with smoking and alcohol; for LPA with arterial hypertension, obesity, smoking and alcohol and for TPA with alcohol and stress.

This behavior suggests that different levels of PA influence in the occurrence of RF and corroborates the literature which mentions higher chances of inactive individuals to present RF[6,22] and that PA practice attenuates the presence of these factors, allowing lower risk for development of CVD[8,23]. This fact deserves some concern, since studies mention that PA has been reduced in the modern society, especially in a group of elderly subjects[24].

Sedentary individuals present more chance to present RF arterial hypertension compared with active ones for OPA and LPA. The association of arterial hypertension and low levels of PA was also observed by Cunha et al.[25], while Pitanga and Lessa[22] found opposite relation between FTPA and arterial hypertension, while the highest chances to present obesity were also found among the sedentary subjects in the LPA. Similar to the findings in this study, Lopes et al.[23] verified higher prevalence of individuals with low PA among the obese ones.

In all levels of PA, the chance of the sedentary subjects presenting RF alcohol was higher than in the active ones, and for the RF smoking this occurred for the FTPA and LPA. Generally, more active individuals present healthier life habits, which may justifyythe lower prevalence of factors such as alcohol and smoking.

The results show also that the chance of active individuals presenting the RF diabetes in OPA and cholesterol in FTPA and TPA was higher in comparison with the sedentary ones; however, it should be mentioned that RF as diabetes and cholesterol may suffer greater influence from eating habits than PA[5], which was not assessed in this study.

As limitation of this study, we can mention the use of questionnaires for measurement of the RF *diabetes mellitus*, cholesterol and triglycerides, which are not gold-standard for such measurements; however, since we are considering cardiac patients who are followed by doctors, it is assumed that these patients are aware of the presence of these RF, which attenuates this limitation. Additionally, the clinical status of the patients inserted in the study was not a variable considered for the analyses, which may have influenced on the scores of the PA levels.

This work presents the importance of focusing on educational and awareness activities concerning RF in cardiac patients engaged in cardiac rehabilitation programs in an attempt to decrease their prevalence and attenuate the deleterious effects on the patients.

CONCLUSION

The results presented that there is high prevalence of RF in cardiac patients who undergo cardiac rehabilitation programs and that, except for the LPA category, the majority of the patients was classified as sedentary. The RF which presented higher chance to occur among the sedentary individuals were blood hypertension, obesity, smoking, alcohol and stress, while the active ones presented higher chance to the RF diabetes and cholesterol, depending on the category of physical activity.

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