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Poor Physical Activity in the Elderly as Assessed by a Visual Analogue Scale is Associated with Dyslipidemia

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Abstract: The aim of the present study was to evaluate the association between a subjective measure of physical activity assessed by a Visual Analogue Scale (VAS) and dyslipidemia in an elderly population of Iran. A total of 74 elderly subjects (39 males) aged 65 years and older who referred to the Cardiovascular Department of the Hospital were studied. Physical activity was assessed on a 100 mm VAS according to which patients were then divided in to two groups active (activity score≥50; n = 31) and inactive (activity score<50; n = 43). Body Mass Index (BMI), systolic and diastolic blood pressure, triglycerides, total cholesterol, Low-Density Lipoproteins (LDL) and High-Density Lipoproteins (HDL) were measured by standard methods. TG ($p = 0.021$) and LDL ($p = 0.006$) were significantly higher and HDL was significantly lower ($p = 0.028$) in the inactive group. No significant associations were found for other variables. As the first report from Iran, present results are important given the race differences that exist in response of plasma lipids to exercise training. Limitations of the present study include its cross-sectional, rather than prospective, structure and the relatively small sample size. It remains to be seen whether VAS can be used as a rapid screening tool for the presence of dyslipidemia in the elderly.

Key words: Dyslipidemia, aged, motor activity, risk factors, visual analogue scale

INTRODUCTION

The world's population is aging. Newly developed countries in Asia are aging faster than other countries in the world. The rate of increase of the elderly population age 65 and older in these countries is reported at approximately 3% annually, compared with 1.0 to 1.3% in the United Kingdom (UK), Sweden and the United States (Ng *et al*., 2006). The Iran's Ministry of Health reported in 2005 that persons 65 and older accounts for 6% of the population of Iran and that this rate will rise to 19% by 2030 (Amir-Sadri and Soleimani, 2005).

Cardiovascular disease is the leading cause of mortality in people aged 65 and older, accounting for half of all deaths (Mathers and Loncar, 2006). Recent emphasis has therefore been placed on the importance of risk factors in predicting morbidity and mortality from cardiovascular disease (CVD). In addition, there is a need to understand how CVD risk factors are influenced by physical characteristics that may be modified by lifestyle measures (Spalding and Sebesta, 2008). The increasing prevalence of CVD in the elderly in developing countries is at least partly attributable to a largely inactive population.

Dyslipidemia is one of the major risk factors for CVD (Wilson *et al*., 1998). It is not clear how physical activity in the elderly affects the lipid profile and whether or not poor physical activity and dyslipidemia cluster together. Total cholesterol levels do not seem to increase with physical inactivity in the elderly (Polychronopoulos *et al*., 2005). However, potential associations between the level of physical activity and triglycerides, low-density lipoproteins and high-density lipoproteins have remained to be clarified in the elderly. The purpose of the present study was to evaluate the relationship between subjectively judged poor physical activity and dyslipidemia in an elderly population of Tehran, Iran.

MATERIALS AND METHODS

This cross-sectional study was conducted on all patients aged 65 years and older who referred to the cardiovascular department of Amir-Alam and Taleghani Hospitals in 2007. Patients with congenital or valvular heart disease were not included. The ethics committee of Tehran University of Medical Sciences approved the study protocol and written informed consent was obtained from all patients.

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Patients were asked to specify their daily activity based on a 100 mm Visual Analogue Scale (VAS) according to which patients were then divided into two groups active (activity score ≥50; n = 31) and inactive (activity score <50; n = 43). The following variables were recorded: age, gender, obesity, systolic and diastolic blood pressure, Triglycerides (TG), total cholesterol (Chol), Low-Density Lipoproteins (LDL) and High-Density Lipoproteins (HDL). Blood pressure was measured from right arm by a single technician. Obesity was assessed using BMI, derived from the Quetelet's formula.

Statistical analysis was performed using SPSS (SPSS, Chicago, IL, USA; version 15). Data are presented as Mean±SD for quantitative variables and as frequency (%) otherwise. The chi-squared test and the Student's t-test were used for comparing categorical and continuous variables, respectively, between the groups. The correlation between continuous variables was determined using the Pearson's correlation coefficient. Throughout analysis, $p<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Seventy four patients (39 males) aged 70.4±4.2 years and with a mean BMI of 28.63±3.9 were studied. Thirty (40.5%) patients were classified as active. BMI was higher in the inactive group though not significantly (p = 0.095). Blood pressure (both systolic and diastolic) was not significantly different between the groups (p = 0.658 and 0.677, respectively). Total cholesterol tended to be higher in the inactive group, but the difference did not reach statistical significance (p =0.154). However, TG (p = 0.021) and LDL (p = 0.006) were significantly higher and HDL was significantly lower (p = 0.028) in the inactive group (Table 1).

Table 1: The difference between the demographic and laboratory data of the patients enrolled in the 2 groups of this study

Parameters	Active (n = 31)	Inactive (n = 43)	p-value
Males (%)	16 (51.6)	23 (53.5)	0.871
Age (years)	69.2±3.5	71.60±4.8	0.643
Body mass index (kg m^{-2})	27.8±3.3	29.47±4.5	0.095
Systolic blood pressure (mm Hg)	132.7±18.1	130.6±19.9	0.658
Diastolic blood pressure (mm Hg)	83.3±8.2	82.3±10.9	0.677
Low-density lipoproteins (mg dL^{-1})	105.65±30.5	131.6±26.3	0.006
High-density lipoproteins (mg dL^{-1})	45.3±9.5	39.7±8.0	0.028
Triglycerides (mg dL^{-1})	160.6±108.2	226.3±168.2	0.021
Total cholesterol (mg dL^{-1})	188.7±47.6	204.53±41.4	0.154

Increased physical activity and fitness are clearly associated with reductions in the risk of cardiovascular disease (Leon *et al*., 1987). However, exercise has been shown by some studies to have little effect on total cholesterol or LDL concentrations and only a minimal and inconsistent beneficial effect on HDL concentrations (Leon and Sanchez, 2001; Durstine and Haskell, 1994; Kraus *et al*., 2002). Furthermore, the situation in the elderly has not been sufficiently studied. In the present study, we focused on individuals aged 65 years and older. Consistent with earlier results, total cholesterol levels were not significantly different between physically active and less active groups (Polychronopoulos *et al*., 2005; Leon and Sanchez, 2001; Durstine and Haskell, 1994). HDL levels were significantly higher in the active group in present study (p = 0.028). The same result was obtained in a prospective randomized study (Kraus *et al*., 2002). Participants were under the age of 65 in the latter study.

Interestingly, there are race differences in response of plasma lipids to exercise training (Bergeron *et al*., 2001) and this points to the importance of conducting studies in different ethnicities. A 10-week biweekly fitness training program along with multidisciplinary nutrition education resulted in significant decreases total cholesterol and LDL-C in the black elderly (Doshi *et al*., 1994). Present study was the first attempt in this direction in Iran. However, because it was a cross-sectional study with a relatively small sample size, we should wait for future studies to confirm present results. Although race influences the plasma lipid response to physical exercise, age does not seem to have the same effect. Indeed, in a prospective study, an aerobic training program induced an antiatherogenic lipoprotein profile and beneficial modifications in body composition and aerobic power in both older and younger subjects; a 2-month interruption in the program changed these parameters unfavorably in both groups (Giada *et al*., 1995). This result further emphasizes the usefulness of physical activity in the elderly.

It should be noted that not all types of exercise lead to improvements in lipid profile in the elderly (Kraus *et al*., 2002). Strength training is the use of resistance to muscular contraction to build the strength, anaerobic endurance and size of skeletal muscles. It is considered a promising intervention for reversing the loss of muscle function and the deterioration of muscle structure that is associated with advanced age. This reversal is thought to result in improvements in functional abilities and health status in the elderly by increasing muscle mass, strength and power and by increasing bone mineral density (Hurley and Roth, 2000). However, contrary to popular belief, strength training does not improve lipid profile

(Hurley and Roth, 2000; Kokkinos *et al*., 1991; Kokkinos and Hurley, 1990; Hurley, 1989). In a study on 11 healthy men and women in their sixties the effects of a 12-month endurance-training program depended on the intensity of the training. Plasma lipid and lipoprotein concentrations were unchanged after low-intensity training, but high-intensity training resulted in an increase in high-density lipoprotein cholesterol and a reduction in triglycerides (Seals *et al*., 1984).

There are a number of limitations with present study. First, prospective studies are needed to be carried out before present results can be applied in clinical practice. Second, the sample size used in present study was small. Finally, we assessed physical activity by the VAS method only. VAS provides a subjective, rather than objective, measure of the clinical phenomenon and is thus subject to higher error rates and lower sensitivities (McCormack *et al*., 1988; Wewers and Lowe, 1990). However, it is instructive that even subjectively judged poor physical activity is associated with dyslipidemia in the elderly. It remains to be seen whether VAS can be used as a rapid screening tool for the presence of dyslipidemia in the elderly.

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