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The Chronic Effects of Morning Exercise Training on Coronary Artery Disease Risk Factors

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ABSTRACT

*The prevalence of coronary artery disease (CAD), mortality and financial burden of those in Iran is growing. Creating an active lifestyle with physical activity is the best prevention of CAD and its risk factors. The aim of this Cross-sectional study was compare of serum concentration of Fibrinogen, Homocysteine, Lipoprotein(a) and Glycosylated Hemoglobin in selected groups (Active, Sedentary, and CAD) of men (40-55 yrs); who were voluntarily participated, was based on NHIS and PA-R questionnaire (N=3*15). Fasting blood sample was taken for measuring serum concentration of fibrinogen (A: 287.86 ± 51.56, S: 299.80 ± 49.21 and CAD: 307.20 ± 63.80 mg/dl), Homocysteine (A: 11.73 ± 2.62, S: 12.40 ± 3.86 and CAD: 11.96 ± 5.11 µmol/L), Lipoprotein(a) (A: 18.06 ± 11.11, S: 22.06 ± 13.99 and CAD: 28.33 ± 7.20 mg/dl) and Glycosylated Hemoglobin (A: 4.26 ± 0.36, S: 4.73 ± 13.37 and CAD: 5.25 ±1.32%). Data analysis with ANOVA and Kruskal-Wallis tests ($p \leq 0.05$). Mean differences of Homocysteine (p=0.898) and fibrinogen (p=0.630) between groups were not significant. Mean differences of Lipoprotein(a) between active and CAD group was significant (p=0.009). Mean differences of Glycosylated Hemoglobin between active and CAD (p=0.002) and between inactive and CAD (p=0.046) were significant. Therefore morning exercise training has not any desirable effects on these risk factors in this study and more studies need to be done to clarify the optimum levels of intensity, duration and type of exercise for desirable change in this risk factors level.*

Key words: Fibrinogen, Homocysteine, Lipoprotein(a), Glycosylated Hemoglobin, Physical Activity.

INTRODUCTION

The prevalence of Coronary Artery Disease (CAD), mortality and financial burden of those in world is growing [1, 7, and 18]. Incidence and mortality from CAD in Iran is increasing [10, 32]. In recent years, considerable success in reducing morbidity and mortality from acute coronary events has been achieved. However, the process of treating the CAD and atherosclerosis and prevention of its complications is a major challenge for researchers [2, 7, 18, and 26]. Risk

factors are variables that appear to be associated with the development and progression of CAD. Study findings showed that factors such as serum levels of homocysteine (Hcy), fibrinogen (Fib), glycosylated hemoglobin (HbA_1c) and lipoprotein(a) [LP(a)] is also associated with the development and progression of CAD [7, 17, 18, 26, 29, 30, and 33]. The results of previous study indicated that long-term physical activity and exercise training is the best way in primary and secondary prevention of chronic diseases, especially coronary artery disease and its underlying processes (atherosclerosis) and lipid disorders in men and women with different age ranges [1, 2, 13, 18, 25, 26, 37, 39, and 40]. The results of Mercedes (2000), Saleem (2001), Peter (2002), Foody (2002), Ernest (2003), Walus (2003), Dimitrios (2003), Antonopoulos (2003), Tamvakos (2003), Solati (2002), Mc Kenzie (2003), Hartgens (2004), Della (2004), Joop (2004), Hayden (2004), Williams (2005), Mora (2006), Tello-Montoliu (2006), Fallah Mohammadi (2006) and Jae (2008) indicated that long-term physical activity and exercise training have beneficial effects and relationship with serum concentration of homocysteine, fibrinogen, glycosylated hemoglobin, and lipoprotein(a). But the results of Mac Kinnon (1999), Durstin (2001), Katrina (2001), Montgomery (2002), Nissen (2002), Mac Kenzie (2003), Sloma (2003), Buyukazi (2005), Lippi (2006), Le Mura (2007) and Heit Kamp (2008) indicated that long-term physical activity and exercise training have not any effects on serum concentration of homocysteine, fibrinogen, glycosylated hemoglobin and lipoprotein(a).Whether the long-term exercise training and physical activity have any effects on the risk factors? Whether an active lifestyle can be reduce the homocysteine, fibrinogen, glycosylated hemoglobin, and lipoprotein(a) in middle aged males, such as, conventional and known risk factors of CAD?

MATERIALS AND METHODS

This descriptive study is a retrospective analysis that determined and compared the concentration of homocysteine, fibrinogen, glycosylated hemoglobin, and lipoprotein(a) levels in selected groups of men. The aim of this Cross-sectional study was compare of serum concentration of Fibrinogen, Homocysteine, Lipoprotein(a) and Glycosylated Hemoglobin in Active (Age: 47.86 ± 5.33 yrs, BMI: 27.96 ± 2.26 Kg/m^2), Sedentary (Age: 43.53 ± 4.34 yrs, BMI: 26.26 ± 2.96 Kg/m^2) and with Coronary Artery Diseases (Age: 48.13 ± 5.85 yrs, BMI: 26.44 ± 2.34 Kg/m^2) groups of men (40-55 yrs); who were qualified voluntarily participated, was based on National Health Interweave Surveys and Physical Activity Rating questionnaire (N=3*15). Criteria of being active, Physical Activity Rating (PAR) score and the American College of Sports Medicine (ACSM) standard at the level of physical activity questionnaires. Fasting blood sample was taken for measuring serum concentration of fibrinogen (A: 287.86 ± 51.56, S: 299.80 ± 49.21 and CAD: 307.20 ± 63.80 mg/dl) with chronometric method; Homocysteine (A: 11.73 ± 2.62, S: 12.40 ± 3.86 and CAD: 11.96 ± 5.11 µmol/L), Lipoprotein(a) (A: 18.06 ± 11.11, S: 22.06 ± 13.99 and CAD: 28.33 ± 7.20 mg/dl) and Glycosylated Hemoglobin (A: 4.26 ± 0.36, S: 4.73 ± 13.37 and CAD: 5.25 ±1.32%) with ELISA method. The Normality of distribution and homogeneity of variance were calculated by used Kolmogorov - Smirnov and Levine tests, respectively. Lipoprotein(a) and glycosylated hemoglobin levels were compared with non-parametric tests of Kruskal - Wallis and (U) Man – Whitney . Homocysteine and fibrinogen were compared with parametric tests of ANOVA and LSD. Significant levels in all tests were $p \leq .05$.

RESULTS AND DISCUSSION

IN table 1 descriptive characteristic of the subjects and variables are presented. Differences of serum concentration of homocysteine (A: 11.73 ± 2.62, S: 12.40 ± 3.86 and CAD: 11.96 ± 5.11 µmol / l) between the groups were not significant ($F (2, 42) = .107$, $p = .898$). Differences of serum concentration of fibrinogen (A: 287.86 ± 51.56, S: 299 ± 49.21 and CAD: 307.20 ± 63.80

mg/dl) between groups were not significant (F (2, 42) = .468, p = .630). Differences of serum concentration of lipoprotein(a) (A: 18.06 ± 11.11, S: 22.06 ± 13.99 and CAD: 28.33 ± 7.20 mg/dl) between groups were significant (χ^2 (15, 2) = 7.047*, p = .03). Difference of lipoprotein(a) was significant between Active and CAD groups (p = .009). Differences of serum concentration of glycosylated hemoglobin (A: 4.26 ± .36, S: 4.73 ± 1.37 and CAD: 5.25 ± 1.32 %) between groups were significant (χ^2 (15, 2) = 9.511*, p = .009). Differences of glycosylated hemoglobin were significant between Active and CAD (P = .002) and Sedentary and CAD groups (p = .046).

Table1. Descriptive characteristics of subjects and study variables (M ± SD).

Groups / Variables	Active (n=15)	Sedentary (n=15)	CAD (n=15)
Age (yrs)	47.86 ± 5.33	43.53 ± 4.34	48.13 ± 5.85
BMI (kg.m^2)	27.96 ± 2.26	26.26 ± 2.96	26.44 ± 2.34
PA-R	5.73 ± 0.59	0.80 ± 0.41	1.00 ± 0.37
Hcy (µmol/l)	11.73 ± 2.62	12.40 ± 3.86	11.96 ± 5.11
Fib (mg/dl)	287.86 ± 51.56	299.80 ± 49.21	307.20 ± 63.80
LP(a) (mg/dl)	18.06 ± 11.11	22.06 ± 13.99	28.33 ± 7.20
HbA_1c (%)	4.26 ± 0.36	4.73 ± 1.37	5.25 ± 1.32

In this study, homocysteine and fibrinogen in active, sedentary and CAD groups were not difference. The results of Katrina (2001), Nissen (2002), Sloma (2003) and Heit Kamp (2008) and this study showed that regular physical activity may not reduce serum levels of these risk factors. Although the results of Foody (2002), Ernest (2003), Walus (2003), Dimitrios (2003), Antonopoulos (2003), Tamvakos (2003), Hayden (2004) Tello-Montoliu (2006) and Jae (2008) showed that regular physical activity may not reduce serum levels of these risk factors. Health conditions, especially in the presence of factors such as smoking, hypertension, obesity (especially abdominal obesity), diabetes, aging and heredity are the factors influencing the serum concentration of fibrinogen. Also, levels of homocysteine affected by age, gender, BMI, diet, vitamin B complex and folate intake, smoking, hypertension, hypercholesterolemia, dyslipidemia, abdominal obesity and diabetes. Despite the differences observed between Lipoprotein(a) and Glycosylated hemoglobin in Active and CAD groups, Lipoprotein(a) and Glycosylated hemoglobin in this study and other study [4, 8, 15, 19-21, 24] have not been affected by physical activity and resistant to training stimulation. If changes in lipoprotein(a) and glycosylated hemoglobin is due to the exercise and physical activity [5, 10, 12, 16, 22, 23, 25, 35] these changes should be represented as the differences between active and sedentary groups, while this results not been observed in this study. Chronic hyperglycemia, diet, heredity, overweight and obesity (especially abdominal obesity), age, sex, hypertension, lipid disorders, body mass index, severity and duration of exercise training are the factors influencing the serum concentration of lipoprotein(a) and glycosylated hemoglobin. In this study, factors such as age, sex, BMI, body mass, supplements and pharmaceuticals intake and CAD-related diseases such as diabetes and hypertension controlled by questionnaire. But, the optimal control of other factors such as diet, smoking, obesity and heredity were impossible. The optimal level of intensity, duration and type of exercise training to reduce these risk factors are unknown. So, to clarify the effect of exercise training on lipoprotein(a), glycosylated hemoglobin, homocysteine and fibrinogen levels more study must be designed and implemented.

CONCLUSION

Mean differences of Homocysteine (p=0.898) and fibrinogen (p=0.630) between groups were not significant. Mean differences of Lipoprotein(a) between active and CAD group was significant (p=0.009). Mean differences of Glycosylated Hemoglobin between active and CAD (p=0.002) and between inactive and CAD (p=0.046) were significant. Therefore morning exercise training has not any desirable effects on these risk factors in this study and more studies need to be done to clarify the optimum levels of intensity, duration and type of exercise for desirable change in these risk factors level

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