SAĞLIK BİLİMLERİ DERGİSİ
JOURNAL OF HEALTH SCIENCES
Erciyes Üniversitesi Sağlık Bilimleri Enstitüsü Yayın Organıdır

Araştırma Yazısı 2015; 24: 129-134

CARDIOVASCULAR RISK FACTORS ACCORDING TO FRAMINGHAM RISK SCORES IN INDIVIDUALS AGED 65 AND OVER*

65 YAŞ VE ÜSTÜ BİREYLERİN FRAMİNGHAM RİSK SKORUNA GÖRE KARDİYOVASKÜLER RİSK FAKTÖRLERİ

Esma ASİL [1], Gülperi HAKLI [2], Mustafa Volkan YILMAZ [1], Yahya ÖZDOĞAN [3], Aslı UÇAR [1], Funda Pınar ÇAKIROĞLU [1], Ayşe Özfer ÖZÇELİK [1], Metin Saip SÜRÜCÜOĞLU[4], Lale Sariye AKAN [5]

[1] *Department of Nutrition and Dietetics, Faculty of Health Sciences, Ankara University, Ankara, Turkey*

[2] *Department of Home Economics, Ankara University, Ankara, Turkey*

[3] *Department of Nutrition and Dietetics, Vocational School of Health Services, Selçuk University, Konya, Turkey*

[4] *Department of Nutrition and Dietetics, Faculty of Health Sciences, Mevlana University, Konya, Turkey*

[5] *Department of Nutrition and Dietetics, Faculty of Health Sciences, Yıldırım Beyazıt University, Ankara, Turkey*

ABSTRACT

Aim: Cardiovascular disease (CVD) plays a major role in worldwide mortality and morbidity. The risk of CVD increases in parallel to the presence of its risk factors. This research was planned to determine the cardiovascular risk factors of individuals aged of 65 and over.

Materials and methods: The research was carried out in 10 health care centers in Ankara (June-July, 2009) with 127 voluntary elderly subjects (30.7% male, 69.3% female) at the age of 65 and over (70.0±4.7 years). Cardiovascular risk was estimated with Framingham risk score. In the score age, LDL cholesterol (LDL-c), HDL cholesterol (HDL-c), systolic and diastolic blood pressure (SBP-DBP), diabetes and smoking habit were regarded as basis.

Results: The average total and LDL-c values varied depending on sex ($p<0.05$). Although we found female participants had significantly higher risk score ($p<0.001$), 10-year CVD risks were found higher than 20% in 28.2% of the men and 18.2% of the women. In 21.3% of the participants, the 10-year CVD risks were found higher than 20%, and in 27.5% were found lower than 10%.

Conclusion: CVD is a multifactorial disease. This disease can be prevented or delayed by paying attention to life style.

Keywords: Cardiovascular risk factors, cardiovascular disease risk, framingham risk score, Turkey

ÖZ

Amaç: Kardiyovasküler hastalıklar (KVH) tüm dünyada mortalite ve morbititeyi arttırmada temel rol almaktadır. KVH riski risk faktörlerinin varlığıyla paralel artış gösterir. Bu çalışmada; 65 yaş ve üzerindeki bireylerin kardiyovasküler risk faktörlerinin belirlenmesi planlanmıştır.

Gereç ve Yöntem: Araştırma Ankara'daki 10 sağlık ocağına gelen (Haziran-Temmuz 2009), 65 ve üzeri yaşta 127 gönüllü yaşlı birey ile yürütülmüştür (%30.7 erkek, %69.3 kadın, 70.0±4.7yıl). Kardiyovasküler risk Framingham risk skoru ile belirlenmiştir. Risk skorlamasında, LDL, HDL kolesterol, sistolik ve diastolik kan basıncı, diyabet varlığı ve sigara kullanımı temel alınmıştır.

Bulgular: Katılımcıların ortalama total ve LDL kolesterol değerlerinin cinsiyete göre değiştiği bulunmuştur ($p<0.05$). Kadınların ortalama risk skorları erkeklerden fazla bulunmasına rağmen ($p<0.001$) 10 yıllık KVH riskinin erkeklerin % 28.2'sinde, kadınların ise % 18.2'sinde %20'nin üzerinde olduğu bulunmuştur. Katılımcıların %21.3'ünde 10 yıllık KVH riskinin %20'den fazla, %27.5'inde %10'dan daha az olduğu saptanmıştır

Sonuç: Multifaktöriyel bir hastalık olan KVH doğumdan itibaren yaşam tarzına dikkat edilerek önlenebilir veya geciktirilebilir.

Anahtar Kelimeler: Kardiyovasküler risk faktörleri, kardiyovasküler hastalık riski, framingham risk skoru, Türkiye

INTRODUCTION

Cardiovascular disease (CVD) plays a major and increasingly prominent role in worldwide mortality and morbidity. The risk of CVD increases in parallel to the presence of its risk factors. Different studies suggest that the death rate from CVD, which was 28.9% in 1990, will increase to 36.3% by 2020 (1,2). Death from CVD occurs in a proportion of 80% in developing countries (3). According to the TEKHARF (Turkish Adult Cardiac Disease Risk Factors) study, two million coro-

*This study was presented at the 10th International Nutrition and Dietetics Congress, 14-18 April 2010, Istanbul, Turkey.

Makale Geliş Tarihi : 02.10.2014
Makale Kabul Tarihi: 23.11.2015

Corresponding Author: Arş. Gör. Esma Asil
Adres: Ankara Üniversitesi Sağlık Bilimleri Fakültesi Plevne cd. Aktaş Kvş. Şükriye Mh. Altındağ/ Ankara
Tel: +903123191450-1157
Fax: +903123197016
E-mail: energin@health.ankara.edu.tr

nary heart disease patients live in Turkey. Turkey finds itself in third position as to the frequency of male cardiac disease and cardiac death, while it is first for the same risks in women (4). The risk factor concept has been used for the first time by the Framingham study investigators (5-7). The Framingham study is a currently ongoing investigation in which the children and also the grandchildren of the initial cohort are being medically followed up. This study, which has been going on longer than 50 years has made a considerable contribution to medical progress in defining cardiovascular risk factors and strategies for their minimization (8,9).

The most important cardiovascular risk factors outside age, sex and hereditary characteristics are hypertension, smoking, hyperlipidemia, diabetes, physical inactivity, obesity and increased consumption of carbohydrate and fat which accompany these (2,10,11). It has been reported that the relation between serum triglycerides and cardiovascular disease is largely due to its correlation to other factors, such as diabetes, obesity, arterial hypertension, elevated low-density lipoprotein cholesterol (LDL-c), and low high-density lipoprotein cholesterol (HDL-c) levels (12). Coronary heart disease is multifactorial and the effect of its risk factors is synergistic. As a result, individual risk factors should be determined first, after which the real risk load can be estimated by multifactorial evaluation (2). The objective of the present study is the evaluation of cardiovascular risk factors in individuals aged 65 or more.

Material and Methods

Participants

A total of 1051 participants over the age of 65, 440 of them male and 611 female, who had consulted at 10 health centers in the province center of Ankara (June - July 2009), participated in this study. However, due to the lack of most of the patient biochemical records, which will be used for estimating CVD risk, Framingham Risk Scorings of only "127 participants" were done (M:39, F:88, 70.0±4.7 years). The research sample was randomly selected from volunteer individuals. Before the study, written informed consent from the participants was obtained. The research data were collected using questionnaire, including a demographic information form and information to allow the determination of cardiovascular risk.

Evaluation of CVD Risk Factors

Participants' CVD risk was estimated with Framingham risk prediction algorithm which were referred to as the Framingham risk score (13). The risk scores are based on age, LDL cholesterol (LDL-c), HDL cholesterol (HDL-c), systolic and diastolic blood pressure, diabetes and smoking habit (12). The CVD risk was calculated separately for each male and female participant. Cutoffs for age (65-69 and ≥70), LDL-c (<100, 100-129, 130-159, 160-190 and ≥190mg/dL), HDL-c (<35, 35-44, 45-49, 50-59 and ≥60 mg/dL), cigarette smoking and diabetes (yes or no) were considered for estimating total risk score (13). All participants' 10 year CVD risk was calculated with their total risk score. Blood lipid profiles and fasting plasma glucose values of participants of the study were obtained from the previous records of the health centers. The systolic (SBP) and diastolic blood pressure (DBP) of the subjects was measured in their right arm while seated. Cigarette smoking status was ascertained by self report.

Anthropometric Measurements

The height and weight of the participants was measured to calculate their body mass index (BMI); those with a BMI under 18.5 kg/m^2 were classified as underweight, 18.5-24.99 kg/m^2 normal, 25.0-29.99 kg/m^2 overweight and 30.0 kg/m^2 or above as obese (14).

Statistical Analysis

The obtained data were evaluated with an SPSS 16.0 (Statistical Package for Social Sciences) software package. Absolute and percentage values were tabulated for the data. The subject's sex was defined as the categorical variable for data analysis. The Chi-squared test was used to determine the significance of differences among the sexes. Independent samples Student's t-test and One Way ANOVA were used to compare average values.

RESULTS

The 41.9% of the elderly participated in the study were male (n:39) and 58.1% female (n:88). With regard to their smoking habit, it was found that 83.0% of the women had never smoked versus 61.5% of men who had given up smoking ($p<0.001$). Nearly half of the participants (45.8%) were not doing any physical exercise. A majority of the participants (48.7%) was overweight according to their BMI (Table I).

Female participants had significantly higher total and LDL cholesterol values (respectively; 191.5±45.7mg/dL, 120.4±42.5mg/dL) than male participants (respectively; 170.3±32.8mg/dL, 98.1±33.9mg/dL) ($p<0.05$). (Table II)

According to the Framingham risk criteria, the average scores of the participants were evaluated (Table III). Accordingly, the risk points were found higher in people≥70 age ($p>0.05$), HDL-c≤44 mg/dL ($p>0.05$), LDL-c≥190 mg/dL ($p<0.001$), SBP≥160 mmHg ($p<0.001$), with diabetes ($p<0.001$) and with cigarette use ($p>0.05$) than the other groups. We found that total risk score was significantly higher in female participants ($p<0.001$).

Also, high LDL-c and SBP values and the presence of diabetes increased the risk scores significantly ($p<0.001$).(Table III)

In 21.3% of the participants who participated in the study, the 10-year CVD risks were found higher than 20 %, and in 27.5% were found lower than 10% (Table IV). 10-year CVD risks were similar in male and female participants ($p>0.05$).(Table IV)

DISCUSSION

Cardiovascular risk determination system is intended to estimate the risk of CVD. In this study, it was found that total cholesterol, LDL-c and total risk score values varied on the average depending on sex ($p< 0.05$). The higher average total cholesterol, LDL-c, DBP and SBP values in women than men influenced the scores to be also higher. Although the average LDL-c, DBP and SBP

Table I: General characteristics of the participants according to sex (n=127) (%)

General Characteristics		Male		Female		Total	
Age groups (years)		n	%	n	%	n	%
	65-69	32	82.1	76	86.4	108	85.0
	≥70	7	17.9	12	13.6	19	15.0
			χ= 0.395, p>0.05				
Smoking	Never	12	30.8	73	83.0	85	66.9
	Former	24	61.5	11	12.5	35	27.6
	Current	3	7.7	4	4.5	7	5.5
			χ= 35.062, **p<0.001**				
Alcohol use	Never	25	64.1	85	96.2	110	86.6
	Current /Former	14	35.9	3	3.8	17	13.3
			χ=17.748, **p<0.001**				
Physical exercise	Daily and regular	11	28.2	16	18.2	27	21.3
	1-2 days/week	2	5.1	6	6.8	8	6.3
	Irregular	13	33.3	21	23.9	34	26.7
	None	13	33.3	45	51.1	58	45.8
			χ=4.180, p>0.05				
BMI	Normal	9	23.1	16	18.2	25	19.7
	Overweight	23	59.0	39	44.3	62	48.7
	Obese	7	17.9	33	37.5	40	31.6
			χ=4.798 p>0.05				

BMI: Body Mass Index

Table II: Average values for blood tests and blood pressures according to sex

Blood test values	$\overline{X}$ ± SD (n)		t-value	p-value
	Male	Female		
Blood glucose (mg/dL)	120.0±36.5 (39)	117.1±38.9 (88)	-0.392	>0.05
Total Cholesterol (mg/dL)	170.3±32.8 (37)	191.5±45.7(86)	2.544	**<0.05**
LDL-c (mg/dL)	98.1±33.9 (39)	120.4±42.5 (88)	2.895	**<0.05**
Triglyceride (mg/dL)	153.7±86.2 (31)	141.8±68.9 (79)	-0.759	>0.05
HDL-c (mg/dL)	45.3±22.9 (39)	45.9±9.5 (88)	0.216	>0.05
DBP (mm Hg)	76.3±12.2 (39)	79.4±11.6 (88)	1.291	>0.05
SBP (mm Hg)	130.9±13.7 (39)	137.4±20.2 (88)	1.850	>0.05

LDL-c: low-density lipoprotein, HDL-c: high-density lipoprotein cholesterol, DBP: diastolic blood pressure, SBP: systolic blood pressure.

values of women were found higher than men, 10-year CVD risks were found higher than 20.0% in 18.2% of the women and 28.2% of the men (Table IV). The higher 10-year CVD risk of the men which correspond to their total risk scores, show that men have higher risk in terms of CVD. In a study carried out in Turkey, in women at age 65 or older, high total cholesterol levels (≥200 mg/dL) and LDL cholesterol (≥130 mg/dL) frequencies were found higher than men. Similarly, the number of men with the risk of developing CVD over 20% in 10 year period was found higher than women (15). As in all the world, prevalence of obesity is also increasing in our country. In a community based study carried out on 12914 individuals in order to determine the cardiovascular risk factors, it was found that obesity is seen mostly women (44.2%, 29.4%, p<0.05), and men are mostly found as overweight (48.7%, 31.4 %, p<0.05) (15). In our study, BMI distribution of the participants, were found similar to the study results of Ünal et al. (15) (Table I). Also, it was found that total ratio of overweight and obesity in women was much more than man (p>0.05). Even though differences in BMI between male and female are not statistically significant, these differences may be caused to higher total cholesterol, LDL-c, DBP and SBP values in women.The necessity of preferring the information such as blood pressure, diabetes, or lipid profile instead of BMI in determining the risk of cardiovascular disease were highlighted in a collaborative analysis in which 58 prospective studies were evaluated (16).

Table III: Average score by Framingham criteria (age, total cholesterol, smoking, HDL-c and SBP) and total risk score of the participants (n=127)

Criteria	n	$\overline{X}$ ± SD	t/F value	p value
Age (y)				
65-69	63	9.4±3.6	-1.138	>0.05
≥70	64	10.1±3.1		
LDL-c(mg/dL)				
<100	52	8.2±2.9[a]		
100-159	63	10.7±2.8	14.526	**<0.001**
160-189	6	12.3±4.2		
≥190	6	14.7±3.1[b]		
HDL-c (mg/dL)				
<35	16	10.2±3.6		
35-44	49	10.5±3.2	2.240	>0.05
45-59	50	9.7±3.2		
≥60	12	7.8±4.8		
SBP (mm Hg)				
<130	36	7.5±3.1[a]		
130-139	33	9.6±2.7[b]	16.143	**<0.001**
140-159	46	11.1±2.9[c]		
≥160	12	13.0 ±2.5[d]		
Diabetes				
No	87	8.8±2.9	-6.149	**<0.001**
Yes	40	12.3±3.1		
Smoking				
No	120	9.9±3.2	1.097	>0.05
Yes	7	10.4±4.2		
Total Risk Score				
Male	39	7.5±2.3	6.633	**<0.001**
Female	88	10.8±3.3		

[a, b ,c ,d] data that have different characters in same column are statistically different.

LDL-c: low-density lipoprotein, HDL-c: high-density lipoprotein cholesterol, SBP: systolic blood pressure.

Table IV: The 10-year CVD risk of the participants according to sex (n=127) (%)

10 year CVD risk	Male		Female		Total		Chi-square value	p-value
	n	%	n	%	n	%		
< %10	8	20.5	27	30.7	35	27.5		
%10-19	20	51.3	45	51.1	65	51.2	2.663	>0.05
≥ %20	11	28.2	16	18.2	27	21.3		

CVD: Cardiovascular Disease

Furthermore different reports support the indication that bringing body weight within normal limits, privileging an increase in physical activity and elevating HDL-c levels is necessary for the prevention and treatment of CVD (2,12,17-24). Also study shows, it was found that exercise did promote beneficial effects on CVD clinical markers such as LDL-c and blood pressures in overweight and obese individuals (17). But in our study, a majority of participants (45.8%) were not doing any regular physical exercise and it was similar in male and female participants (p>0.05). Lack of regular physical activity could be related to the high average age of the participants.

It has been reported that alcohol intake over a moderate level (30-40 g for men and 10-20 g for women) increases CVD risk substantially (25). However in the current study it was found only 86.6% of the participants have never consumed alcohol. Low alcohol consumption, which is a criteria of CVD risk, is a positive finding. This result could be related to religious tendencies, it is known that alcohol consumption is forbidden in Islam.

Smoking is one of the risk factors that independently increase the risk of CVD (26) and smoking habits are also included in Framingham risk scoring criteria. It

was found that 83.0% of the women and 30.8% of the men that participated in the research have never smoked. In a study in Germany, smoking habits of Turkish women were found significantly lower than German women (27). Women's lower smoking habit is influencing the Framingham risk score in a positive way.The mean fasting blood glucose was above normal in female and male participants (respectively 117.1±38.9 mg/dL, 120.0±36.5 mg/dL, p>0.05). The Framingham study established that the clinical CVD risk was increased twofold in men and threefold in women when comparing diabetic subjects to non-diabetic ones in the 45-74 age group at 20-year follow-up (28). Similarly, a study performed in China showed that the presence of diabetes or prediabetes increases the risk of CVD over a 10-year period. Given that the CVD risk is related to disturbances of fasting blood glucose levels, no significant difference in CVD risk was found among the groups (29).

As a result, the opinion that, in order to be able to reduce blood glucose, BP and serum cholesterol, it is necessary to fight simultaneously against all, not separately, has made itself more pressing with the publication of positive results from recent large-scale clinical studies (8).

This study has several limitations. It is a relatively small sample size, which included only elderly people who applied to the health centers and the blood samples were obtained from previous records. Therefore, future research in this field needs to be designed with larger sample sizes including people across a wide range of ages with current blood samples.

REFERENCES

1. Pearson TA, Blair SN, Daniels SR, et al. AHA Guidelines for primary prevention of cardiovascular disease and stroke:2002 update. Circulation 2002;106:388-391.
2. Smith Jr SC, Allen J, Blair SN, et al. AHA/ACC Guidelines for secondary prevention for patients with coronary and other atherosclerotic vascular disease: 2006 update. Circulation 2006;113:2363 -2372.
3. Bitton A, Gaziano T. The Framingham Heart Study's impact on global risk assessment. Prog Cardiovasc Dis 2010;53:68-78.
4. Onat A. Halkımızda kalp damar riski yüksek bireylerin sayısı hakkında. Türk Kardiyol Dern Arş 2000;28:407-408.
5. Dawber TR, Kannel WB, Lyell L. An approach to longitudinal studies in a community: The Framingham Study. Ann N Y Acad Sci 1963;107:539–556.
6. Dawber TR, Meadors GF, Moore FE. Epidemiological approaches to heart disease: The Framingham Study. Am J Public Health Nations Health 1951;41:279–281.
7. O'Donnell CJ, Elosua R. Cardiovascular risk factors. Insights from Framingham Heart Study. Rev Esp Cardiol 2008;61:299–310.
8. Güleç S. Kalp damar hastalıklarında global risk ve hedefler. Arch Turk Soc Cardiol 2009;37:1-10.
9. D'Agostino RB, Pencina MJ, Massaro JM, et al. Cardiovascular Disease Risk Assessment: Insights from Framingham. Glob Heart 2013;8:11-23.
10. Frohlich J, Al-Sarraf A. Cardiovascular risk and atherosclerosis prevention. Cardiovascular Pathology 2013;22:16–18.
11. Johns DJ, Lindroos AK, Jebb SA, et al. Dietary patterns, cardiometabolic risk factors, and the incidence of cardiovascular disease in severe obesity.Obesity 2015;23:1063-1070.
12. Kim JR, Oberman A, Fletcher GF, et al. Effect of exercise intensity and frequency on lipid levels in men with coronary heart disease: Training Level Comparison Trial. Am J Cardiol 2001;87:942-946.
13. Wilson PW, D'Agostino RB, Levy D, et al. Prediction of coronary heart disease using risk factor categories. Circulation 1998;97:1837-1847.
14. World Health Organization- BMI Classification 2006. http://apps.who.int/bmi/index.jsp (Erişim Tarihi: 17/05/2014)
15. Unal B, Sözmen K, Uçku R, et al. High prevalence of cardiovascular risk factors in a Western urban Turkish population: a community-based study. Anadolu Kardiyol Derg 2013;13:9-17.
16. Wormser D, Kaptoge S, Di Angelantonio E, et al. Separate and combined associations of body-mass index and abdominal adiposity with cardiovascular disease: Collaborative analysis of 58 prospective studies. Lancet 2011;377:1085-1095.
17. Gondim OS, Camargo VT, Gutierrez FA, et al. Benefits of regular exercise on inflammatory and cardiovascular risk markers in normal weight, overweight and obese adults. PLOS One 2015;10: e0140596.
18. Vanhees L, Schepers D, Heidbuchel H, Defoor J, Fagard R. Exercise performance and training in patients with implantable cardioverter-defibrillators and coronary heart disease. Am J Cardiol 2001;87:712-715.
19. Church TS, Lavie CJ, Milani RV, Kirby GS. Improvements in blood rheology after cardiac rehabilitation and exercise training in patients with coronary heart Disease. Am Heart J 2002;143:349 -355.
20. Kirwan LD, Mertens DJ, Kavanagh, T, Thomas SG, et al. Exercise training in women with heart disease: Influence of hormone replacement therapy. Med Sci Sports Exerc 2003;35:185-192.
21. Thaulow E, Fredriksen PM. Exercise and training in adults with congenital heart disease. Int J Cardiol 2004;97:35-38.
22. Goldhammer E, Tanchilevitch A, Maor I, et al. Exercise training modulates cytokines activity in coronary heart disease patients. Int J Cardiol 2005;100:93-99.
23. Blumenthal JA, Sherwood A, Babyak MA, et al. Effects of exercise stress management training on markers of cardiovascular risk in patients with ischemic heart disease: A randomized controlled trial. JAMA 2005; 293:1626-1634.
24. Sanchis-Gomar F, Fiuza-Luces C, Lucia A. Exercise as the master polypill of the 21st century for the prevention of cardiovascular disease. Int J Cardiol 2015;181:360–361.

25. Özçelik AÖ, Sürücüoğlu MS, Yılmaz MV. Şarap ve Sağlık, "1. Ulusal Bağcılık ve Şarap Sempozyumu ve Sergisi Bildiri Kitabı". İzmir: Dinç Ofset; 2008:171 -178 .

26. Turhan NÖ. Kadın ve erkek sağlığını koruma stratejileri ve tarama programları. Turkiye Klinikleri J Med Sci 2008;28:255-261.

27. Uitewaal PJ, Goudswaard AN, Ubink-Veltmaat LJ, et al. Cardiovascular risk factors in Turkish immigrants with type 2 diabetes mellitus: Comparison with Dutch patients. Eur J Epidemiol 2004;19:923 -929.

28. Kannel WB, McGee DL. Diabetes and cardiovascular disease. The Framingham Study. JAMA 1979;241:2035-2038 (abstract).

29. Li Q, Chen AH, Song XD, et al. Analysis of glucose levels and the risk for coronary heart disease in elderly patients in Guangzhou Haizhu district. Nan Fang Yi Ke Da Xue Xue Bao 2010;30:1275-1278 (abstract).