

Efficiency of the Framingham, Cuore and Score Scales in Primary Care

Framingham, Cuore ve Score Ölçeklerinin Birinci Basamaktaki Etkinliği

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Summary

Objective: It is aimed to determine the socio-demographic features and cardiovascular risk factors of 20-79 years aged patients that apply to Çiğli Atatürk Organized Industrial Zone Neighborhood Family Medicine Polyclinic of Tepecik Education and Research Hospital and addition to this to compare the sufficiency of three cardiovascular risk models Framingham, Cuore and Score in the primary health care.

Material and Methods: The study is a sectional and a descriptive survey that was carried out between 15 September and 29 February of 2012. A questionnaire that was formed by the researchers was administered to 193 participants whose verbal consents' obtained. For the analysis of data set chi-square test, percent analysis and factor analysis were performed by using of SPSS 16.0.

Results: The study consists of 109 male (56,5%) and 84 female (43,5%) participants. It is found that 49,2% of the patients has medication for hypertension, 25,4% has isolated systolic hypertension and 19,7% has high-normal levels of arterial blood pressure. It is determined that the rate of hypertension in women is higher than in men. The body mass index is detected 30,10 kg/m² in women while 28,2 kg/m² in men. Versus the women; men are found to be at a higher risk of cardiovascular events in terms of blood lipid levels. In men mean LDL, HDL and TG levels are detected 131,36±37,36 mg/dl, 39,96±7,73 mg/dl and 155,90±78,31 mg/dl in turn while the levels are 124,42±31,35 mg/dl, 43,80±8,7 mg/dl and 127,18±67,20 mg/dl respectively in women. When it is assessed by life-style and nutrition it is considered that 60,6% of the patients does not do any physical exercises. According to our results it is found no significant difference in cardiovascular risk between the patients that drink neither 1-2 cup of tea nor 7 (p<0,63). When each of the 10-year cardiovascular risk assesment models are evaluated by their components, it is observed that HDL, gender and age are the 3 major factors in Framingham model. In Cuore model age, treatment of hypertension and gender are found to be the 3 major factors and in the Score model gender and age are the first 2 major factors.

Conclusion: As a conclusion the sample rate of the hypertension is higher than the data detected for the Aegean region of Turkey. The rates of HT and BMI increased since 1998. Total cholesterol, LDL and TG values are higher in males than females in all age groups in both genders. As assessed by validity, Framingham and Score have similar validations but the Framingham model is found to be more successful in detecting the male sex high-risk individuals while the Score model is more practical. Cuore model is an inappropriate choice in terms of the usability cause of invalidity.

Key Words: Cuore, framingham, score, scale.

Özet

Amaç: Tepecik Eğitim ve Araştırma Hastanesi Çiğli Atatürk Organize Sanayi Bölgesi Aile Hekimliği Polikliniğine başvuran 20-79 yaş arası hastaların sosyodemografik özelliklerini ve kardiyovasküler risk faktörlerini belirlemek ve buna ek olarak birinci basamak sağlık hizmetlerinde Framingham, Cuore ve Score kardiyovasküler risk ölçeklerinin etkinliğini karşılaştırmak hedeflenmiştir.

Gereç ve Yöntem: Çalışma, 15 Eylül - 29 Şubat 2012 tarihleri arasında gerçekleştirilen kesitsel ve tanımlayıcı bir anket çalışmasıydı. Sözlü onayları alınmış 193 katılımcıya araştırmacılar tarafından oluşturulan bir anket uygulandı. Veri seti ki-kare testi analizi için yüzde analizi ve faktör analizi SPSS 16.0 kullanılarak yapılmıştır.

Bulgular: Araştırma 109 erkek (%56,5) ve 84 kadın (%43,5) katılımcıdan oluşmaktadır. Hastaların %49,2'sinde hipertansiyon için ilaç, %25,4'ü izole sistolik hipertansiyon ve %19,7'sinde normal arter kan basıncı seviyeleri olduğu tespit edilmiştir. Kadınlarda hipertansiyon oranının erkeklerden daha yüksek olduğu belirlenmiştir. Beden kitle indeksi

kadınlarda 30,10 kg/m² iken erkeklerde 28,2 kg/m² olarak tespit edilmiştir. Kadınlara kıyasla; erkekler kan lipid düzeyleri açısından kardiyovasküler olaylar açısından daha yüksek bir risk altındadırlar. Erkeklerde LDL, HDL ve TG düzeyleri sırasıyla 131,36±37,36 mg/dl, 39,96±7,73 mg/dl ve 155,90±78,31 mg/dl olarak saptanırken sırasıyla 124,42±31,35 mg/dl, 43,80±8,7 mg/dl ve 127,18±67,20 mg/dl idi. Yaşam tarzı ve beslenme ile değerlendirildiğinde, hastaların%60,6'sında fiziksel egzersiz yapılmadığı düşünülmektedir. Bulgularımıza göre, 1-2 fincan çay içmeyen 7 hasta arasında kardiyovasküler risk açısından anlamlı bir fark bulunmamıştır (p<0,63). Her 10 yıllık kardiyovasküler risk değerlendirme modelleri bileşenleri tarafından değerlendirildiğinde Framingham modelinde HDL, cinsiyet ve yaşın 3 önemli faktör olduğu gözlemlenmiştir. Cuore modeli çağında hipertansiyon ve cinsiyete göre tedavi 3 ana faktör olarak bulunurken, Score modelinde cinsiyet ve yaş ilk iki ana faktördür.

Sonuç: Sonuç olarak, hipertansiyonun örnekleme hızı Türkiye'deki Ege bölgesi için tespit edilenlerden yüksektir. HT ve BMI oranları 1998'den beri artmıştır. Toplam kolesterol, LDL ve TG değerleri erkeklerde her iki cinsiyette her yaş grubunda kadınlara göre daha yüksektir. Geçerlilik ile değerlendirildiğinde, Framingham ve Score'un benzer geçerlilikleri vardır, ancak Framingham modelinin erkek cinsiyet yüksek riskli bireylerin saptanmasında daha başarılı olduğu, Score modeli daha pratik olduğu bulunmuştur. Cuore modeli geçersizliğin kullanılabilirlik sebebi açısından uygunsuz bir seçimdir.

Anahtar Kelimeler: Cuore, Framingham, Score, ölçek.

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Introduction

Definition of cardiovascular disease, involving all parts of the vascular bed, describes a group of diseases including coronary heart disease (CHD), cerebrovascular diseases (stroke), peripheral vascular disease, thoracic and abdominal aneurysms (1). According to the Report of Chronic Diseases there are about 2 million patients with coronary artery disease in Turkey; all over the world, 17 million people per year die of causes related to the cardiovascular diseases (2).

In spite of increased awareness of cardiovascular diseases and the good progress in the fight against to risk factors in recent years; these diseases are still the most important cause of death in both developed and developing countries (2). Determining the early diagnosis and treatment approaches in cardiovascular disease prevention, identification of the priority risk factors and taking measures against them may be life-saving. In this context, periodic health examinations done in the primary health services are very valuable.

Different scoring systems created as a result of large cohort studies all around the world, have been used to determine the risk of cardiovascular disease. The first of these risk models is the Framingham Risk Model, was created by the data from a 12-year follow-up study conducted between the years of 1949-1961 at the state of Massachusetts of United States and the final version of it was reported by the National Cholesterol Education Program/Adult Treatment Panel III (NCEP/ATP III-2002). Then The Prospective Cardiovascular Münster

(PROCAM), Systemic Coronary Risk Evaluation (SCORE), Cryogenic Underground Observatory for Rare Events (CUORE), Assessing Cardiovascular Risk Using Sign (ASSIGN), QRISK Scale, Reynolds Score, National Health and Nutrition Examination Survey I Epidemiologic Follow-up Study (NHEFS), Joint British Society (JBS) and World Health Organization (WHO) risk models have been developed (2).

These risk models calculates the risk of 10-year coronary heart disease or cardiovascular events but not of a lifetime. For this reason after the first risk calculation, these risk models should be repeated at every periodic physical examination and a computer-based customized patient record system should be set up within the next processes in order to detect and follow up the possible risk changes.

Determination of which is the most suitable risk model for cardiovascular disease prevention and risk factor detection, is controversial. Based on this information, in this study it is aimed to determine the socio-demographic characteristics and the risk factors of the patient group that forms the sample in terms of guiding the provision of preventive health care services and to compare the effectiveness of the existing 10-year cardiovascular risk scales Framingham, Cuore and Score, to investigate whether these models are suitable for use in primary care.

Material and Methods

The research is approved by the 10.12.2011 dated fourth decision of Izmir Tepecik Training and

Research Hospital Ethic Committee. The study is carried out on verbal informed consent of the patients that applied to Çiğli Atatürk Organized Industrial Zone Family Medicine Clinic of İzmir Tepecik Training and Research Hospital at the dates of 15 to 30 September 2011 and 11 January to 28 February 2012.

The universe of the study:

The number of patients in the universe is stored in the data-base of the polyclinic computer system and as the incidence of cardiovascular events differ in terms of gender, the sample sizes of both sexes are calculated separately and the smallest number that has the ability to represent the universe is found to be 175 people in total. Standart deviation value was taken 0.05. Due to exclusion of 18 patients that have cardiovascular disease equivalent diseases previously; those 10% of all cases were included later and the research was conducted on 193 cases. The study is a cross-sectional, descriptive, questionnaire study.

Patients are required to be at the age of 20-79 years age range not having a known coronary artery disease. Patients, not excluded with type-2 diabetes mellitus and/or other coronary artery disease equivalent diseases were included in 'very high risk' group in terms of 10-year cardiovascular risk.

Data Sources of the study:

After the poll of 'the socio-demographic characteristics questionnaire' that is developed by the researchers, Framingham Risk Scale regarding to risk factors was administered to the patients. The Framingham Scale, created in 1998 investigates the risk of 10-year coronary heart disease (myocardial infarction, coronary death, angina) by scoring the age, gender, total cholesterol (T.chol), low density lipoprotein (LDL) and high density lipoprotein (HDL) cholesterol levels, the presence of hypertension (HT) (Whether or not the treatment) and type-2 diabetes mellitus and smoking. Accordingly, the 10-year risk of coronary heart disease identified three groups (low, medium, high risk) (3,4).

One of the new risk models in Europe is the SCORE risk score that is based on data from the SCORE project. In this model the risk is calculated by consideration of age, gender, systolic blood pressure, total cholesterol, HDL cholesterol, and

cigarette smoking. Besides the risk of death from coronary heart disease, SCORE risk score calculates the 10-year-fatal atherosclerotic events (such as stroke or rupture of an abdominal aortic aneurysm) (5).

Cryogenic Underground Observatory for Rare Events (CUORE) risk scale includes the age, total cholesterol, systolic blood pressure, HDL cholesterol, diabetes, antihypertensive treatment and smoking risk factors. The result gives the 10-year risk of fatal and nonfatal major coronary and cerebrovascular events including revascularization and sudden death (6).

Statistical Evaluation:

For statistical analysis, the statistical programme Statistical Package for Social Sciences (SPSS) 16.0 for Windows was used. Percentage distribution of descriptive statistical methods, the mean value and standard deviation were used for processing the data of the study. The results were stated as mean±standard deviation (mean±SD) and minimum-maximum ranges of values were specified in parentheses. Each of the parameters that make up Framingham, Cuore and Score risk scales were evaluated by factor analysis as to their factor loads. Evaluation of the validity of the results obtained from the sample was done by using of chi-square test that used to compare qualitative data between groups. Results were evaluated at % 95 confidence interval, significance $p < 0.05$.

Results

Of the total of 193 patients included in the study, 56,5% were male (n:109) and 43,5% (n:84) were female, while the mean age was $48,89 \pm 12,91$ years (min:21, max:79), respectively. Of the 193 participants, %80,8 were married (n:156). In terms of level of education, %50,3 (n:97) of the study group were primary school graduates. Of all the cases, %30,6 (n:59) were workers, %24 (n:47) were housewives and %22,8 (n:44) were retired. In terms of alcohol and cigarette use, questionnaire results showed that %63,7 (n:125) of the cases have never used alcohol before; while %1,6 (n:3) have each day on the regular consumption of alcohol and it is found that %52,3 (n:101) of the patients were non-smokers, %27,5 (n:53) were smokers and %20,2 (n:39) were off smoking.

Blood lipid levels of patients in the sample were analyzed and total cholesterol values were observed to be 50,3% (n:97) at a desired level, 35,2% (n:68) at borderline high level and 14,5% (n:28) at high level, respectively. Mean T-chol. value was found to be 199,38±41,53 mg/dl.

Considering LDL-cholesterol levels in terms of optimal, desired, borderline high, high and very high levels; the results were 18,1% (n:35), 34,7% (n:67), 30,1% (n:58), 13,0% (n:25) and 4,1% (n:8), respectively. Mean LDL-cholesterol value was 128,34±34,95 mg/dl.

Evaluation of HDL-cholesterol levels showed that 56,5% (n:109) of patients had normal HDL levels while 40,9% (n:79) of them had low. Mean HDL value was found 41,63±8,37 mg/dl.

TG levels of the sample were found to be as, 62,7% (n:121) desired, 20,2% (n:39) high and 16,6% (n:32) borderline-high level. Due to the lack of laboratory kit, 1 patient's TG level was not detected. Mean TG value was 143,48±74,92 mg/dL.

When the patients were grouped according to their arterial blood pressure values it is found that, 29,5% (n:57) of the cases were at an optimal, 16,6% (n:32) normal, 19,7% (n:38) normal-to-high level and add to this, 4,7% (n:9) had stage-1, 3.1% (n:6) stage-2,

1.0% (n:2) stage-3 hypertension and at 25,4% (n:49) of all, isolated systolic hypertension was detected.

Case group was evaluated in terms of body mass index and it is found that 38,9% (n:75) was composed of patients with normal weight, 34,2% (n:66) fat, 20,2% (n:39) mild fat, 3,6% (n:7) severe overweight and 3,1% (n:6) mild weak. Mean BMI was 29,04±5,7 kg/m².

193 patients included in the study were put through Framingham, Coure and Score scales. According to the obtained data, the patients were divided into sub classes for each scale. Framingham risk scoring demonstrated that, 51,8% (n:100) of the patients at low-risk group were followed by very high-risk grouped patients with the ratio of 29,0% (n:56). According to Cuore classification, 43,0% (n:83) of the cases found to be at intermediate risk group. This was followed by low-risk group with 35,8% (n:69). The patients were evaluated according to the Score Scale, and %31,1 (n:60) of patients received a very high risk group with the risk of 15,0% or higher. 26,9% (n:52) of the patients were in the 1% low-risk group and that was followed by the 2% low-risk grouped patients with the proportion of 11,4% (n:22) (table 1).

Table 1. The ten-year cardiovascular risk distribution of cases in Framingham, Coure and Score scales

Scale	Risk group		n	%
Framingham	Low risk group		100	51.8
	Intermediate risk group		15	7.8
	High risk group		22	11.4
	Very high risk group		56	29.0
COURE	Low risk group		69	35.8
	Intermediate risk group		83	43.0
	High risk group		12	6.2
SCORE	Risk group: < % 1	Risk-free group	21	10.9
	Risk group: % 1	Low Risk group	52	26.9
	Risk group: % 2		22	11.4
	Risk group: % 3 – 4		15	7.8
	Risk group: % 5 – 9	Intermediate risk group	10	5.2
	Risk group: % 10 – 14	High risk group	4	2.1
	Risk group: % 15 and over	Very high risk group	60	31.1

Later, these models were studied for efficacy in relation to each other. Each of the ten-year risk calculation model parameters were evaluated in terms of factor loadings by factor analysis methods and it is observed to occur 3 factors for each of the Framingham and Cuore Scales and 2 factors for Score. For Framingham risk scale it is found that age and the hypertension treatment composed the first factor load (eigen-value: 0,854, 0,804 respectively); total cholesterol and HDL cholesterol levels made the second factor load (eigen-value: 0,879, 0,761 respectively); gender and smoking made up the third factor load (eigen-value: 0,875, 0,629 respectively). In analysis of Cuore Model; age, systolic arterial blood pressure value, the presence of type-2 DM and hypertension treatment

composed the first factor load (eigen-value: 0,797, 0,686, 0,678, 0,666 respectively); total cholesterol and HDL cholesterol levels formed the second factor load (eigen-value: 0,862, 0,759 respectively); sex and smoking made the third factor load (eigen-value: 0,832, 0,673 respectively). The Score risk scoring analysis demonstrated that the systolic arterial blood pressure value, age, and total cholesterol level made the first factor load (eigen-value: 0,788, 0,743, 0,566 respectively) while gender and cigarette smoking creating the second factor load (eigen-value: 0,798, 0,776 respectively) (table 2).

Table 2. The prominent factors of Framingham, Cuore and Score Scales

Scale	Factor	Components	Eigen-value
Framingham	1. Factor	Age	.854
		HT	.804
	2. Factor	Total Cholesterol	.879
		HDL	.761
	3. Factor	Gender	.875
		Smoking	.629
CUORE	1. Factor	Age	.797
		Systolic TA	.686
		DM	.678
		HT	.666
	2. Factor	Total Cholesterol	.862
		HDL	.759
	3. Factor	Gender	.832
		Smoking	.673
	SCORE	1. Factor	Systolic TA
Age			.743
Total Cholesterol			.566
2. Factor		Gender	.798
		Smoking	.776

In consideration of extraction of squared loadings of each component alone or together for a total risk load, it is found to come out 3 components for Framingham risk model, 3 components for Cuore model and 2 components for Score model. In Framingham model, the level of HDL cholesterol alone is found to be very effective in determining the ten-year cardiovascular risk in the study group by a ratio of 28,48%; in case of risk assesment by HDL cholesterol and sexes together had a detection rate of %52,05% and consideration of all three parameters HDL cholesterol, gender and age, had

the 71,12% validity rate for cardiovascular risk assesment. The evaluation of Cuore model in terms of risk analysis demonstrated that detection rate of 26,53% in terms of age alone, an increased ratio of 46,24% by consideration of age and blood pressure treatment together and a rising validity in predicting the level of risk with a proportion of 62,28% by consideration of all three components age, gender and blood pressure treatment, respectively. The risk analysis for Score model demonstrated that the gender has a determining ratio of 31,46% stand-alone on risk detection, and in the case of the

evaluation of the two components, gender and age together, an increased ratio of 56,97% (table 3).

Table 3. Extraction loads of prominent factors of Framingham, Cuore and Score Scales

Scale	Components	Extraction Load %
Framingham	HDL	28.48
	HDL+Gender	52.05
	HDL+Gender+Age	71.12
CUORE	Age	26.53
	Age+HT	46.24
	Age+HT+Gender	62.28
SCORE	Gender	31.46
	Gender+Age	56.97

Based on these data, the obtained results were adapted to our own sample set and in evaluation of 28,48% validity of Framingham risk score in terms of HDL cholesterol level; the ratio of the patients at high and very high risk group with low or normal HDL cholesterol levels, was found to be higher than expected with the ratio of 39,89% (n:77). Considering male patients in terms of gender, with low and normal HDL cholesterol levels that are at the high and very high-risk group of Framingham scoring; the acquired rate of 44,9% was under the expected rate of 52,05% (n:109). In the same group, evaluation of HDL cholesterol, gender and the patients over 40 years old in terms of age; demonstrated that 57,8% (n:76) of the cases were at high and/or very high risk group, but this rate was also lower than expected. In evaluation of Cuore model, by age; high-risk group of patients over the age of 40 years in our sample group were included in the analysis and the detected ratio of 6,21% (n:12) was lower than the expected result of 26,3%. The 12 female patients receiving hypertension treatment were not included in Cuore analysis that evaluated the male gender and those not taking the treatment of hypertension as risk factors; so the results of analysis with the components of hypertension treatment and gender were found to be 0,0%. For this reason, Cuore model was determined to be not suitable as an option for our country that belongs to high-risk grouped countries in terms of cardiovascular risk. In consideration of Score model, the validity of gender that was obtained as a stand-alone level of 31,46%, was applied to our sample and the ratio of male patients at high and

very high risk groups was detected over than expected as 36,6% (n:40). The same risk group was assessed as those above the age of 40 and the ratio of the males over 40 years old observed to be 52,8% which was below the expected value of 56,97% (table 4).

Table 4. Rates of the prominent factors of Framingham, Cuore and Score Scales in the sample group

Scale	Components	Rate of Cases - %
Framingham	HDL	39.89
	HDL+Cinsiyet	44.90
	HDL+Cinsiyet+Yaş	57.80
CUORE	Yaş	6.21
	Yaş+HT	0.00
	Yaş+HT+Cinsiyet	0.00
SCORE	Cinsiyet	36.60
	Cinsiyet+Yaş	52.80

Discussion

The World Health Organization reveals that the incidence of cardiovascular diseases could be halved by blood pressure, obesity, cholesterol and tobacco control (7). In Framingham study, the high-normal level of blood pressure nominated for the development of hypertension, is shown to double the risk of CVD (8).

World Health Organization announces that smoking is the major health problem in the world (9). According to the results of the smoking study conducted in Isparta city, Turkey in 2011, 12% of the young population were current smokers (10). In our study, 27,5% of all the patients were smokers. This ratio remains below the average of Turkey.

The mean total cholesterol level of Turkish people between the ages of 35-64 is detected to be 185 mg/dl for males, and 192 mg/dl for females. Cholesterol level that continues in low values until the age of thirties; becomes to be 188 mg/dl in males and 204 mg/dl in females over the age of 40 by an increase of approximately 25% compared to the old values. At the age of 40 years and above cholesterol level of woman becomes to be higher than that of the men (11). According to the results obtained from this study total cholesterol levels were found to be lower in women than men.

In Turkish Heart Study, mean LDL levels detected as 136 and 111 mg/dl in turn for males and females (12). Consistent with the Turkish Heart Study, results of our study demonstrated a higher mean LDL level in men than women.

Mean HDL-cholesterol levels in Turkish adults are 37,2 mg/dl in males and it is 44,9 mg/dl in females (13). Correspondingly, in the study mean HDL cholesterol levels in males and females were found as 39,9 mg/dl and 43,8 mg/dl in turn; 74% of men and 53% of women were determined to have low HDL levels.

Health infrastructure and organization have to be regulated to win the war with cardiovascular diseases and focus on to arrange the primary health care services; the fact that there is prevention on the basis of the war with cardiovascular diseases should be noted, while treatment services have only a limited impact (7).

Based on the factor analysis for each scoring system the first three factors for Framingham determined to be the HDL level, gender and age while it is the age, gender and hypertension for Cuore. According to Score, gender and age make up the first two in terms of validity. The parameters in both models, age, and gender should be noted that are common cardiovascular risks cannot be changed. The Score Model that is identified to be 56,97% effective with only these two parameters (age and gender) on validity, seems to be very practical for use in primary health care. The validity did not reach this value in our study group exactly but was quite approaching with the level of 52,8%. In the evaluation of the case sample for Framingham model, the HDL level alone was determined to have a rate of 39,9% validity, compared to the 28,48% expected effect.

In the risk assessment made by gender in our study, the majority of women were in low-risk group for each of the three risk models. In men, the majority was detected to be at the high-risk group by Framingham, at the moderate risk group according to Cuore, and at the low-risk group of Score. However, this result is compatible with the results of the Coronary Risk Score for Turkish Adults formed by Onat et al.; in the study of us in primary care the validity of this model increased by the addition of gender parameter but remained below the level of the expected (11,13).

Cuore model was found to be an unsuitable option for our country on account of the availability in the high-risk countries in terms of cardiovascular risk.

Each of the three risk models was observed to have limitations on determining the risk of society. The reason of this may be, those risk scores are based on the algorithm obtained from the Framingham cohort. Framingham cohort was a relatively small, middle-class cohort most of whom were white (2). However, for this purpose more broad-based studies are needed to be done across the country; yet there has not been done an assessment for Turkish society by using of this calculation (14).

As a matter of fact, validation of compliance with the characteristics of our people of the improved version of SCORE proposed for our country of high-risk populations has not been made yet. The other scoring system Framingham is projected to predict a lower risk of cardiovascular events in our people (15). Although there is not a study for which one of these scoring systems needed to be preferred; in a study with hypertensive patients that compares the predictive value of ischemic heart disease in Framingham and SCORE scales, SCORE has been observed to have higher sensitivity and negative predictability (16). A risk calibration that will monitor the constant variations, will only be possible by the high-quality, up to date data on mortality and the prevalence of risk factors. Therefore in every European country, to reflect the changes of mortality and risk factor distribution over time, recalibration of SCORE schedules is recommended (5).

Conclusion

As it is seen there is not an ideal model for the moment. Due to the fact that the majority of patients who do not visit the physician, actually are the people who need treatment the most; the right time of population-based screening for CVD risk reduction may be considered as has come (17). For CVD screening of the target population that are the individuals between the ages of 40-50 years, the family physician's office is the most probable location. After calculating the risk of cardiovascular disease, this information should be shared with the patient and a common plan should be established in order to take the necessary measures.

References

1. Uçmak M, Barışık V, Can H, Köse Ş, Ömer Z, Atila D, et al. Relationship between hepatitis B virus seropositivity and atherosclerosis through C-reactive protein. *Smyrna Tıp Dergisi* 2012;2(2):1-4.
2. Şendur MAN, Güven GS. Kardiyovasküler Risk Modelleri; İdeal Bir Model Var mı? Hacettepe University Acta Medica 2010;41(3):171-8.
3. Lloyd-Jones DM, Larson MG, Beiser A, Levy D. Lifetime risk of developing coronary heart disease. *Lancet* 1999;353:89-92.
4. D'Agostino RB, Sr, Vasan RS, Pencina MJ, Wolf PA, Cobain M, Massaro JM, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. *Circulation* 2008;117:743.
5. Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R, et al. European guidelines on cardiovascular disease prevention in clinical practice: executive summary. Fourth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice. *European Heart Journal* 2007;28:2375-414.
6. Gaziano T. The Framingham Heart Study's Impact on Global Risk. *Progress in Cardiovascular Diseases Journal* 2010;53(1):68-78.
7. World Health Organization. Obesity and Overweight Fact Sheet No:311, Geneva. <http://who.int/mediacentre/factsheets/fs311/en/print.html> Accessed on: 21.04.2012
8. Vasan RS, Larson MG, Leip EP. Assessment of frequency of progression to hypertension in nonhypertensive participants in the Framingham Heart Study: A cohort study. *Lancet* 2001;358:1682-6.
9. World Health Organization. CVD-Risk Management Package for low and medium resource settings. Cardiovascular Disease Programme. World Health Organization Ceneva, 2002.
10. Kara S, Baş FY, Açıkalm C. Attitude to smoking and affecting factors: A study of first and last term students of medical and dentistry faculties. *Smyrna Tıp Dergisi* 2011;1(1):16-21.
11. Onat A, Türkmen S, Karabulut A, Yazıcı M, Can G, Sansoy V. Türk yetişkinlerinde hiperkolesterolemi ve hipertansiyon birlikteliği: sıklığına ve kardiyovasküler riski öngördürmesine ilişkin TEKHARF çalışması verileri. *Türk Kardiyol Dern Arş* 2004;32:397-405.
12. Mahley RW, Palaoğlu KE, Atak Z. Turkish Heart Study: lipids, lipoproteins and apolipoproteins. *Journal of Lipid Research* 1995;36:839-59.
13. Onat A, Hergenç G, Uzunlar B, Ceyhan K, Uyarel H, Yazıcı M et al. Türk toplumunda koroner risk faktörü olarak HDL kolesterol: öngördürücülüğü, belirleyicileri ve ilişkileri. *Türk Kardiyol Dern Arş* 2003;31:9-16.
14. Tekkeşin N, Kılınç C, Şanlı Ökmen A. Investigation of Framingham Risk Factors in Turkish adults. *Journal of Clinical and Experimental Investigations* 2011;2(1):42-9.
15. Onat A, Can G, Hergenç G, Küçükduymaz Z, Uğur M, Yüksel H. High absolute coronary disease risk among Turks: involvement of risk factors additional to conventional ones. *Cardiology* 2010;115:297-306.
16. Ural D, Bildirici U, Ağaçdiken A, Yılmaz C, Vural A, Şahin T. Comparison of two cardiovascular risk stratifications in predicting presence of silent myocardial ischemia in hypertensive patients. *European Heart Journal* 2004;25:208.
17. Ural D. Kardiyovasküler risk belirlenmesi ve tabakalandırılmasının kılavuzluğuyla yapılan tedavi yaklaşımı: Öngör, önle ve bireyselleştir. *Anadolu Kardiyoloji Dergisi* 2011;11:551-6.

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