

The Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) Scale: a validity and reliability study

Kardiyovasküler Hastalıklar Risk Faktörleri Bilgi Düzeyi (KARRİF-BD)
Ölçeği'nin geçerlik ve güvenilirliği

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Objectives: We developed a questionnaire to measure the knowledge level of adults about risk factors for cardiovascular diseases (CVD) and assessed its validity and reliability.

Study design: We developed the Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) Scale in the light of literature data. It consisted of 28 items, questioning the features of CVD in the first four items, risk factors in 15 items, and the results of adopting a risk-free attitude in nine items. All the items were based on true/false statements, requiring a response in the form of "Yes", "No" or "Don't know". To determine its validity and reliability, the scale was administered to 200 participants older than 20 years, of whom 144 individuals were involved in test-retest evaluations. Internal consistency was estimated using the Cronbach's alpha. To determine the validity of the scale, individuals with CVD and/or family history were compared with those without CVD and/or family history.

Results: The rates of true responses varied between 44.5% and 96.5%. The mean score was 19.3±3.2 (range 5 to 27), and the median item-total correlation was 0.26 (range 0.13 to 0.51). The internal consistency coefficient (Cronbach's alpha) was 0.768. There was a strong positive correlation between the test and retest total scores ($r=0.850$; $p=0.000$). Individuals with CVD and/or family history had a significantly higher mean score than those without CVD and/or family history ($20.2±3.1$ vs $19.3±3.2$; $p=0.032$).

Conclusion: In Turkey, CARRF-KL is the first scale developed to measure the knowledge level of individuals about risk factors for CVD, with good indices of validity and reliability.

Key words: Cardiovascular diseases; questionnaires; risk assessment; risk factors; validation studies as topic.

Amaç: Erişkinlerde kardiyovasküler hastalık (KVH) risk faktörleri ile ilgili bilgi düzeyini ölçmede kullanılacak bir ölçek oluşturuldu ve bunun geçerlik ve güvenilirliği değerlendirildi.

Çalışma planı: Kardiyovasküler Hastalıklar Risk Faktörleri Bilgi Düzeyi (KARRİF-BD) Ölçeği, literatürden yararlanılarak hazırlandı. Ölçekte yer alan 28 maddeden ilk dördü kardiyovasküler hastalıkların özelliklerini, 15 madde risk faktörlerini, dokuz madde ise risk davranışlarında değişimin sonucunu sorgulamaktaydı. İfadeler doğru veya yanlış olabilen tam bir cümle şeklinde sunuldu ve katılımcılardan "Evet", "Hayır" veya "Bilmiyorum" şeklinde yanıtlamaları istendi. Ölçek, güvenilirlik ve geçerliğin test edilmesi amacıyla 20 yaş üzeri 200 kişiye uygulandı ve 144 kişide test ve tekrar test sonrası değerlendirme yapıldı. Ölçeğin iç tutarlılığını belirlemek için Cronbach alfa katsayısı hesaplandı. Testin geçerliğinin belirlenmesinde, kendisinde ve/veya ailesinde KVH öyküsü olan bireylerde ölçeğin puan ortalaması, öyküsü olmayan bireylerle karşılaştırıldı.

Bulgular: Maddelere doğru yanıt yüzdesi %44.5 ile %96.5 arasında değişmekteydi. Ölçeğin puan ortalaması 19.3±3.2 (dağılım 5-27), madde-toplam korelasyonunun ortanca değeri 0.26 (dağılım 0.13-0.51) bulundu. Test iç tutarlılık katsayısı (Cronbach alfa) 0.768 bulundu. Test ve tekrar test sonrasında elde edilen toplam puanlar arasında çok güçlü ilişki saptandı ($r=0.850$; $p=0.000$). Kendisinde ve/veya ailesinde KVH öyküsü olan bireylerde puan ortalaması ($20.2±3.1$), KVH öyküsü olmayan bireylere ($19.3±3.2$) göre daha yüksek bulundu ($p=0.032$).

Sonuç: Geliştirilen KARRİF-BD Ölçeği, Türkiye'de bireylerin KVH risk faktörleri ile ilgili bilgi düzeyini belirlemede kullanılacak, güvenilirlik ve geçerliği gösterilmiş ilk ölçek özelliğini taşımaktadır.

Anahtar sözcükler: Kardiyovasküler hastalık; anket; risk değerlendirmesi; risk faktörü; geçerlik çalışması.

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Cardiovascular diseases (CVD) are the leading cause of mortality worldwide. Although there is a trend toward a decrease in developed countries, the incidence of cardiovascular diseases is likely to increase in developing countries. 80% of deaths due to cardiovascular diseases and 87% of health deteriorating conditions occur in developing countries.^[1-4] Community based prevention programs aimed at behavioral changes have been effective in decreasing the prevalence of cardiovascular diseases in developed countries. Studies have demonstrated that unhealthy lifestyle and social environment are the underlying factors of cardiovascular diseases. Although about 200 risk factors have been identified for this disease group, the factors which can be controlled are, hypertension, hyperlipidemia, obesity, diabetes mellitus, unhealthy dietary habits, smoking, physical inactivity and stress.^[5,6] Lifestyle is the key factor in community-based prevention programs since lifestyle modifications and behavioral changes are cheaper and more effective approaches.^[7]

Social behavioral models suggest that knowing the negative consequences of individual's behavior on his/her health is the basic factor in behavioral change. Since insufficient knowledge would cause insufficient motivation in lifestyle and behavioral changes, CVD prevention activities focus on community-based education programs.^[6,7]

Cardiovascular disease prevention is based on two fundamental strategies: (i) high risk strategy by identifying high risk individuals and patients in the society, and protecting them against new cardiovascular events; (ii) general population strategy by preventing low risk individuals who form the greater part of the community, and will possibly form the bigger part of future cardiovascular disease patients.^[8] Measurement of the knowledge level of individuals about CVD risk factors is required for both risk strategies. However, there are very few studies on this topic. In addition existing studies have focused on community-based assessments on primary prevention of CVD. Community-based knowledge trend and changes have also been measured in certain studies.^[9-11]

There is no standard questionnaire accepted to measure the knowledge level of individuals about CVD risk factors.^[4] However, two methods are being used to measure knowledge level about risk factors of individuals: (i) CVD risk factors are listed and participants are required to answer by True/False; (ii) participants are required to list the CVD risk factors themselves. The knowledge levels of participants are higher with the first method.^[9]

The importance of knowledge level evaluation in Turkey is becoming increasingly important for planning education programs which form the basis of informative

studies for CVD risk factors, assessing the efficacy of these programs, and following up populations in terms of CVD risk factors.

This study was aimed at developing a scale to measure the knowledge level of adults about CVD risk factors and identifying validity and reliability of this new scale.

MATERIALS AND METHODS

Preparation of the scale. Recent literature data, patient education materials and prevention guidelines of national and international cardiology societies were reviewed to prepare the scale.^[12-14]

While developing The Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) Scale, 16 items from the Heart Disease Fact Questionnaire (HDFQ) and 4 items from the 40-Item Coronary Heart Disease Knowledge Test were translated into Turkish.^[15,16] These items were re-translated into English by a person who had no connection with the study. In addition, 8 items (5, 8, 9, 10, 17, 18, 22, 26) which are considered to be known about the risk factors of cardiovascular diseases were added and a scale with 28 items in total were prepared.

The scale was publicly assessed in the training and research region of the Public Health Department before being finalized. Discussions on every item were performed during the in testing phase.

The first 4 items were examining the factors like characteristics of CVD, prevention and age, 15 items (items 5, 6, 9-12, 14, 18-20, 23-25, 27, 28) were examining the risk factors and 9 items (items 7, 8, 13, 15, 16, 17, 21, 22, 26) were examining the outcome of changes in risk behaviors. All the items were presented in the form of complete true or false statements, requiring participants to respond by "Yes", "No" or "Don't know." Each correct answer was given a score of 1. Six of the statements in the scale were wrong and these were inversely encoded compared to the rest. The maximum total score was determined as 28.

A pilot test was applied to a group of 10 participants for initial assessment of the scale. All participants reported that the test was open, understandable and non problematic. No significant difference between mean total scores was obtained when results between independent observers (S.M. and I.A.) was tested ($t=1.255$; $p=0.241$).

Study group. The sample size was identified by *power* analysis before the study. The sample size was identified as 196 considering a 25%-nonresponse rate for items before and after the test and a 5%-alpha error to test a 10% difference and two dimensional analyses and a 80%-power of the test (power: $1-\beta$).

The study was conducted on 140 participants among personnel of the deanery and hospital of Eskisehir

Osmangazi University Faculty of Medicine and 60 participants working in a workplace close to the city.

Measurements. In addition to CARRF-KL scale questioning, the participants were asked about their demographic characteristics, and their personal or family history of CVD and high blood pressure, high cholesterol level, high triglyceride level, diabetes mellitus and heart failure.

Analyses. Data obtained from the study were assessed by SPSS 13.0 programme in three stages.

In the first stage, the correlation between each scale variable and scale total score was demonstrated by measuring the correct response rate. A p value for each scale variable represented the correct response rate. For instance, if a P value was 0.90, it represented a correct response rate of 90% by the participants. Similar to literature practice, an increase in P value was interpreted as a decrease in different responses for each question. Our assumptions are not only based on the increase in P value. Measurement errors should also be detected. Measurement errors are known to be lower with easy questions compared to difficult ones. To prevent the effect of "Don't know" on the result, this response was accepted as "false". All P values are approximately 0.50 with simple measurement scales like CARRF-KL. A P value should be 0.50-1.00 according to Nunnally's guide.^[15] It is well known that obtaining a P value is not sufficient to develop a scale. Consistency coefficient of item-total score which presents the effect on the total score of every item is also important. All questions in a reliable scale should be interrelated with each other. The consistency coefficient of item-total score is required to be above 0.20.^[17] However, items and P values with when the coefficient above 0.10 were also considered as the scale was not psychologically based.

In the second stage, the reliability of the scale was assessed. The correlation between test-retest scores after three weeks was determined in order to assess the consistency of the CARRF-KL scale. The internal consistency of the scale was estimated using the Cronbach's alpha reliability coefficient with the Kuder-Richardson approach. The Kuder-Richardson approach is based on estimating the internal consistency of all items with each other and the complete scale. The Cronbach's alpha reliability coefficient is a mean weighted standard deviation calculated with the proportion of total variations of *k* item to overall variation. Reliability reference range of coefficient is as follows: , no reliability ≤ 0.40 ; low reliability, 0.40-0.60; significant reliability, 0.60-0.80; and high level reliability 0.80-1.00.^[17]

In the third stage, the validity of the scale was assessed. Validity is the ability to measure accurately a specific feature of a scale without the interference of another feature.^[6]

Given that individuals with CVD and/or a family history of CVD had better knowledge level, group results were compared in this regard.

RESULTS

Study group. The study group consisted of male (47.5%) and female (52.5%) participants and the mean age was 33 ± 9 (range 18-54). 40.5% of participants were <30 years; 36.5% were 30-39 years; 20% were 40-49, and 3% were ≥ 50 years old. In addition 28% of the participants were primary school graduates; 36.5% were high school graduates and 35.5% were university graduates. 14.5% of the participants had one of the chronic diseases such as hypertension, diabetes mellitus, heart failure, high cholesterol, angina, and stroke. 60% also had first-degree relatives who had such diseases (Table 1). The medical history of some participants did not present with more than one of the comorbidities of hypertension, diabetes mellitus and CVD, since almost 90% of the study group were <50 years. Comorbidities were present in the participants' first-degree relatives.

Item analysis. The correct response rate of CARRF-KL scale fluctuated between 44.5% and 96.5%. Two of the P values were between 40-49%; 4 of them were between 50-59% and 70-79%; and 6 of them were between 60-69%, 80-89% and 90-99% (Figure 1).

Mean score of the scale was 19.3 ± 3.2 , median score was 19.0, and the score range was between 5 and 27.

Table 1. Demographic and clinical characteristics of the study group (n=200)

Variables	No	Percentage (%)
Age groups (years)		
20-29	81	40.5
30-39	73	36.5
40-49	40	20.0
50+	6	3.0
Sex		
Male	95	47.5
Female	105	52.5
Level of education		
Primary school	56	28.0
High school	73	36.5
University	71	35.5
Medical history		
No chronic disease	171	85.5
Hypertension	11	5.5
Diabetes mellitus	3	1.5
Heart disease	15	7.5
Family history of CVD		
No	80	40.0
Yes	120	60.0

Median item-total score correlation was 0.26 and the range was 0.13-0.51 (Table 2).

Reliability assessment. There was a positive correlation between both method scores with respect to the test and retest total scores (Spearman: $r=0.850$; $p=0.000$; Figure 2). This suggests a very strong, parallel and valid relation between the results if applied periodically. Median correlation value of test-retest scores was 0.64 whereas the range was 0.44 to 0.83 and p values were statistically significant.

Internal consistency coefficient of the scale was estimated by test-retest reliability. Following the test, internal consistency was determined as 0.768 (Cronbach's alpha).

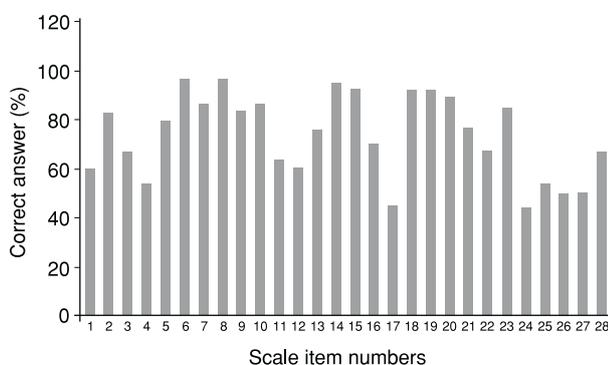


Figure 1. Correct answer rates of scale items

Validity assessment. It was considered that individuals with CVD and/or family history of CVD had a better knowledge level in the assessment of the validity of the scale. Individuals with and without CVD history were compared. The mean score of individuals with CVD and/or a family history of CVD was higher (20.2 ± 3.1) than those without CVD and/or a family history of CVD (19.3 ± 3.2) ($t=2.156$; $p=0.032$).

DISCUSSION

In our study the CARRF-KL scale which was developed to measure the knowledge levels of individuals concerning CVD risk factors together with its internal consistency, good items difficulty, good content and reliability features, was assessed.

Our aim was to develop a scale which would measure the education efficiency levels of high risk individuals who visit primary healthcare and individuals in the general population. Measurement of knowledge level will help to plan other studies aimed at increasing awareness of individuals about CVD risk factors.

Healthcare professionals are the unique providers of the correct, appropriate and extensive knowledge to the public. Only less than half of family medicine specialists check diet and physical activity routinely in the primary care institutions. However, preventing smoking, fatty

diet, and sedentary life style plays a key role in public health.^[9] As a result, the CARRF-KL scale has the quality of reminding physicians and patients about all CVD risk factors which can be controlled.

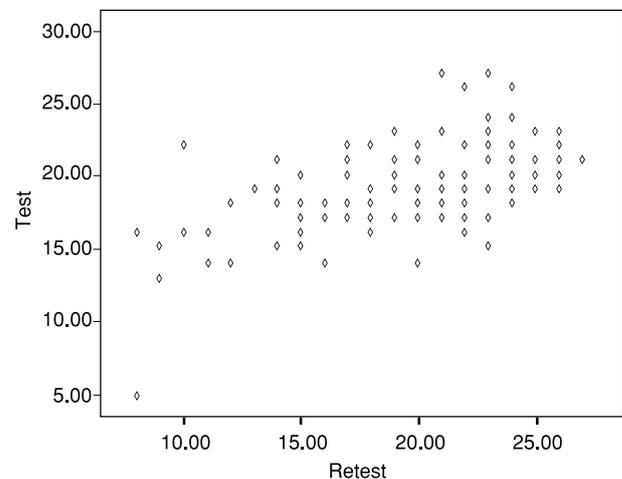


Figure 2. Scattered diagram of scores obtained in the test-retest assessment

Internal validity was not expected to be high due to the characteristics of heterogeneity of the items in the scale. Hence, two items with <0.20 total correlation were not excluded from the scale. The p values of these items were 83% and 63.5%. Two items, including 17 (Slow walking and wandering are also considered as exercise) and 23 (High cholesterol is a risk factor for heart disease) had item difficulty. The correct response rate of the other items was between 0.50 and 1.0. An internal consistency of 0.768 calculated by the Kuder-Richardson 20 formula also suggests that the test is considerably reliable.

Score comparison of known groups is also a method to estimate test-structure validity.^[16] Ideally, the association between scores and knowledge-risk of behaviors should have also been demonstrated in the scale. The most important of the scale assessment analyses was the higher results of individuals who had a personal and family history of CVD. As would be expected, the mean score obtained from the scale would increase if individuals had a history of CVD or risk factor. Failing to obtain such an increase can be explained by the higher education level of the participants compared to the general population. Cross analysis of the findings demonstrated that the scale was not only a psychometric test, but also was directly associated with the risk factors and was a useful scale.

The major limitation of the study was the selection of the participants who had a higher education level compared to the general population. Lower scores of several items can also be explained by the lack of community-based prevention programs about CVD risk factors in our country. Another limitation of this study was the imbalance between scale-item weight for the

Table 2. Comparison of test-retest results for questions used in the scale

	Correct (%)	Scale mean if item deleted	Scale variance if item deleted	Item total correlation	Scale alpha if item deleted
1. A person always realizes if he/she has a heart disease.	60,0	26,48	26,03	0,26	0,77
2. A family history of CVD increases your risk of having heart disease.	83,0	26,21	28,19	0,13	0,77
3. Elderly people are at a higher risk for heart diseases.	67,0	26,34	27,46	0,20	0,77
4. Coronary heart diseases can be prevented.	54,0	25,87	26,47	0,34	0,76
5. Smoking is a preventable cause of death and diseases in our country.	79,5	26,21	27,78	0,20	0,77
6. Smoking is a risk factor for heart disease.	96,5	26,19	28,49	0,20	0,77
7. The risk of developing heart disease is reduced when smoking is stopped.	86,5	26,19	27,84	0,24	0,76
8. It is beneficial to eat 2-3 portions of fruit and 2 portions of vegetable daily.	96,5	26,20	28,85	0,20	0,77
9. It is harmful to eat red meat more than 3 times a week.	83,5	26,20	27,59	0,27	0,76
10. Eating salty lead to increases in blood pressure.	86,5	26,21	27,87	0,23	0,76
11. Fatty meals do not increase the cholesterol level in blood.	63,5	27,04	27,90	0,16	0,77
12. Fats that are solid at room temperature are beneficial for heart health.	60,0	26,84	26,42	0,27	0,76
13. A low carbohydrate and low fat diet is beneficial for heart health.	75,5	26,17	27,02	0,32	0,76
14. Overweight individuals have higher risk of heart disease.	95,0	26,17	28,16	0,30	0,76
15. Regular exercise reduces the risk of heart disease.	92,5	26,24	28,63	0,20	0,77
16. Risk can be reduced by exercising only in a gym.	70,5	26,77	26,77	0,26	0,76
17. Slow walking and wandering are also considered as exercise.	45,0	26,50	27,33	0,21	0,77
18. Stress, sorrow, and burden increase the risk of heart disease.	92,0	26,20	28,13	0,23	0,76
19. Blood pressure increases under stressful conditions.	92,0	26,13	27,98	0,30	0,76
20. High blood pressure is a risk factor for heart disease.	89,0	26,11	27,99	0,24	0,76
21. Blood pressure control reduces the risk of heart disease.	76,5	26,04	26,85	0,39	0,76
22. Hypertension medications should be used for a lifetime.	67,5	26,13	26,30	0,40	0,76
23. High cholesterol is a risk factor for heart disease.	85,0	26,10	27,34	0,37	0,76
24. There is a risk of heart disease if good (HDL) cholesterol is high.	44,5	26,03	23,89	0,48	0,75
25. There is a risk of heart disease risk if bad (LDL) cholesterol is high.	54,0	25,81	26,08	0,44	0,75
26. Every person with high cholesterol level is given medicine.	50,0	26,19	24,50	0,46	0,75
27. Diabetes is a risk factor for heart disease.	50,5	25,94	25,17	0,51	0,75
28. The risk can be reduced in diabetic patients with glucose control.	66,5	25,98	26,19	0,45	0,75

incidence of existing risk factors in our country. For instance, there was only one question about obesity, although it is an increasing public health problem in Turkey.

Consequently, we developed an effective scale which is easy to fill in and which identifies the impact of education programs on the prevention of CVD risk factors. This scale is the first reliable and valid scale used to measure knowledge levels of individuals about CVD risk factors in Turkey. However, the reliability of this scale should be tested in larger populations and as a result further research and development programs about the scale are required.

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