Application of Healthy Heart program in the two semi-rural areas in Eskişehir

Eskişehir'de iki yarı-kırsal bölgede Sağlıklı Kalp programı uygulaması

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ABSTRACT

Objective: The purpose of this study was to raise awareness of people in two semi-rural regions of Eskişehir in terms of cardiovascular diseases (CVD) risk factors and to promote related heart-healthy behaviors.
Methods: The study was a semi-experimental intervention and featured as a two-phase design. In the first phase of the study, participants received visits at home. Individuals in intervention and control areas were given a participation form that indicated the Framingham Risk Score (FRS). Other training materials were distributed throughout the intervention area. The second phase was planned as a nested case- control study. The first phase included 2.766 persons and the second phase included 778 persons. In the evaluation of the data the Pearson Chi-square and Student's t-test for independent samples, Mc-Nemar Chi-square and the paired t-test for dependent samples were applied.
Results: During the first phase, the frequency of FRS metrics above 10% was 26.2% for males, 18.1% for females in the intervention area, 22.9% for males, and 14.9% for females in the control area. There was no difference between males and females in terms of scoring for control and intervention areas ($p>0.05$). Based on the FRS data, the second phase revealed a decrease of 15.4% in males ($p<0.001$) and 10.2% in females ($p<0.001$) in the intervention area and an increase of 8.2% in males ($p=0.011$) and 3.8% in females ($p=0.078$) in the control area.
Conclusion: In this study, teaching individuals who were older than twenty years of age about cardiac health seemed to be an effective method for decreasing CVD risk factors. *(Anadolu Kardiyol Derg 2011; 11: 485-91)*
Key words: Cardiovascular disease, community-based prevention, intervention, health education

ÖZET

Amaç: Çalışma Eskişehir'in yarı kırsal iki bölgesinde halkta kardiyovasküler hastalık (KVH) risk faktörleri konusunda, uygun davranış değişikliğini sağlamak ve bu konuda farkındalığı arttırmak amacıyla planlandı.
Yöntemler: Bu çalışma yarı deneysel bir çalışma olup, iki aşamalı olarak planlandı. Çalışmanın ilk aşamasında evler ziyaret edildi. Müdahale ve kontrol bölgelerinde bireylere Framingham risk skorlarının (FRS) yazıldığı katılım formları dağıtıldı. Diğer eğitim materyalleri ise müdahale bölgesine dağıtıldı. İkinci aşama yuvalandırılmış vaka- kontrol çalışması şeklinde planlandı. Birinci aşama 2766 kişide, ikinci aşama 778 kişide gerçekleşti. Verilerin değerlendirmesinde bağımsız gruplarda Pearson Ki-kare ve bağımsız örneklem Student t-testi, bağımlı gruplarda Mc-Nemar Ki-kare ve eşleştirilmiş t-testi uygulandı.
Bulgular: Birinci aşamada Framingham Risk puanının %10'un üzerinde olma sıklığı kontrol bölgesinde erkeklerde %22.9, kadınlarda %14.9, müdahale bölgesinde erkeklerde %26.2, kadınlarda %18.1 olup puanlama açısından erkek ve kadınlarda kontrol ve müdahale bölgeleri arasında bir fark bulunamadı ($p>0.05$). İkinci aşamada müdahale bölgesinde erkeklerde %15.4 ($p<0.001$), kadınlarda %10.2'lik bir azalma saptanırken ($p<0.001$), kontrol bölgesinde erkeklerde %8.2 ($p=0.011$), kadınlarda %3.8'lik bir artış bulundu ($p=0.078$).
Sonuç: Yirmi yaş üzeri bireylere KVH ve risk faktörleri açısından eğitim verilmesinin KVH risk faktörlerinin azaltılmasında etkin bir yöntem olduğu bulundu. *(Anadolu Kardiyol Derg 2011; 11: 485-91)*
Anahtar kelimeler: Kardiyovasküler hastalık, toplum tabanlı korunma, müdahale, sağlık eğitimi

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The study results were presented at the 13th National Public Health Congress, 18-22 October, 2010, İzmir, Turkey
Accepted Date/Kabul Tarihi: 16.12.2010 **Available Online Date/Çevrimiçi Yayın Tarihi:** 25.07.2011

doi:10.5152/akd.2011.131

Introduction

Today, cardiovascular diseases (CVD) are a globally significant cause of death. Specifically, approximately 17.1 million people died of CVD across the world in 2004, equivalent to 30% of the global death toll (1). Most of these deaths (80%) occurred in low and medium income countries. If appropriate measures are not taken, it is estimated that nearly 20 million people will die of CVD annually by 2015 (2, 3).

It is possible to prevent CVD and a decreasing trend has been reported in developed countries. It has been shown that community-based protection programs are especially effective in promoting this decrease. The aim of these programs is to inform the public, raise awareness, create positive and permanent behavioral change in respect of major risk factors and integrate all approaches aimed at minimizing risk across all layers of society (4).

In Turkey, CVD causes 21.7% of deaths among all major disease groups at the national level (5). Even though the National Cardiac Health Policy indicates that implementation of community-based programs should be prioritized, there has been no conclusive study of this subject to date. Thus, the Eskişehir Healthy Hearts Project (ESKAP) has been designed as both a community-based intervention and a research study.

The purpose of this study was to raise awareness among people in two semi-rural regions of Eskişehir in terms of CVD risk factors and to promote related heart-healthy behaviors.

Methods

The study focused on a sample of people from several semi-rural settlement areas in Eskişehir, which is located in the Central Anatolia Region of Turkey. In 2009, according to official records, the total population of Eskişehir was 741.736, of which 498.134 (67%) were between 20-69 years of age.

Permission for this investigation was granted by Osmangazi University, Medical Faculty Ethical Committee (study registration code 2009/252). The informed consent was obtained from all participants of the study.

Population metrics and data collection

The study focused on two semi-rural areas, each 20 km away from Eskişehir (Çukurhisar as the intervention area and Muttalip for the control area).

In both regions, the majority of people are employed in factory work and farming. In these two regions, distance from the city centre, livelihood and lifestyle of the people are similar to each other and they have both urban and rural properties. On account of this, these two regions were selected for the study. The number of people aged 20 to 69 in the intervention group was 2.376 and the number in the control group was 4.681.

This is an intervention study, which is done in two phases between January 2008 and October 2009. In the first phase of the study, participants received visits at home and those individuals who were willing to participate responded to survey questions (Everyone between the ages of 20-69 years who agreed to participate was included in the study in both areas).

In order to perform tests and to take blood samples, these individuals were also invited to visit local research centers in each respective area.

The aforementioned survey collected socio-demographic information, CVD risk factors, medical histories and family histories of all participants. The STEPwise manual published by the World Health Organization (WHO) was used to evaluate the survey used in the study and to monitor the risk factors (6).

First phase of the study

The first phase was implemented with a total of 2.766 people, including 1.117 (40.4%) males and 1.649 (59.6%) females; 1.448 (52.3%) of these individuals were in the control area and 1.318 (47.7%) were in the intervention area (Fig. 1). ESKAP Project Participation Forms were distributed through promotional meetings, in order to record the Framingham Risk Score (FRS) values for participants in both areas. Individuals with a FRS 10% and above were assessed to be risk. No intervention was made in the control area, but the participants in the intervention area were periodically reminded of relevant risk factors through phone calls. Individuals at especially high risk of CVD were referred to their family doctors. Other training materials were distributed during the 12th month of the follow-up.

In the first phase, the frequency of FRS above 10% was 22.9% for males and 14.9% for females in the control area and 26.2% for males and 18.1% for females in the intervention area. No statistically significant difference was found between male and female individuals in terms of scoring for the control and intervention areas ($p>0.05$).

Second phase of the study

Samples of the second phase were taken from first phase of the study. The second phase was planned as a nested case-

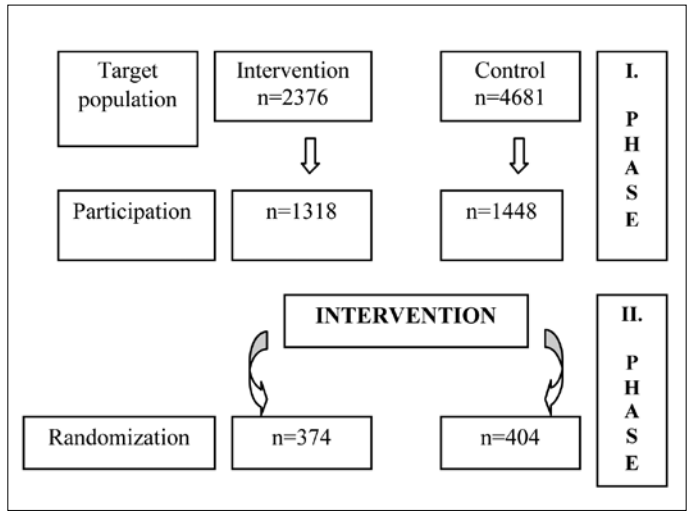

Figure 1. Flow diagram of the study

control study in order to re-evaluate post-intervention CVD risk factors after 22 months had elapsed. The fraction of individuals at risk was assumed to equal 20%; a difference between the intervention and control groups of more than 5% was accepted as significant. Type I error (unidirectional α) was set at 5% and the power of the study to determine the actual difference (1-β) was set at 80%; using these numbers, the minimum number of individuals in each group was calculated as 369 (7).

The ones who participate in the first phase were invited to the second phase. The study was completed with 374 participants in the intervention group and 404 participants in the control group (because of surplus in the first phase 10%). Participants were selected from both areas using a systematic sampling method (Fig. 1).

In the second phase, the percentage of individuals reporting FRS values of above 10% was 20.6% in the control area and 20.3% in the intervention area; no statistical difference was found between these areas ($p>0.05$).

While there was no significant difference between study groups in the first and second phases in terms of socio-demographic characteristics or average age ($p>0.05$), the number of females was higher in the control area when compared to the intervention area ($p<0.001$).

Measurements

A fasting blood sample was drawn for biochemical analysis early in the morning after an overnight fast (10-12 h). Blood was allowed to clot for 30 min at room temperature and serum was obtained via centrifugation (15 min). The serum was immediately transported to the laboratory in cold boxes filled with ice and was analyzed at a certified Clinical Chemistry Laboratory on the same day. Total plasma cholesterol (Total-C), triglyceride (TG), HDL cholesterol (HDL-C), LDL cholesterol (LDL-C) and glucose levels were measured using an enzymatic colorimetric method. All measurements were assessed by means of a Modular auto-analyzer (Roche Diagnostics, Switzerland). Systolic and diastolic blood pressures were measured one time on each arm using a standard mercury sphygmomanometer in subjects who had been lying down for five minutes. The mean of the two measurements was used for analysis.

Body weight, height, waist circumference and hip circumference data for all participants were measured using standard methods. All participants were weighed while wearing light clothing but no shoes. Body mass index (BMI) was calculated as body weight (in kilograms) divided by height (in meters) squared.

We defined the term smoker as a person who smokes at least one cigarette a day. In order to determine nutrition habits, inquiries were made into the participant's consumption of oil, fresh vegetables, fruits, red meat and salt. The oil types appraised were vegetable, animal, margarine and mixes. We defined "inappropriate eating of fat" as consuming animal fats and margarine. Inappropriate eating habits were defined as follows: eating three or more servings of red meat per week, eating vegetables three times a day or less, and eating fruit two times a day or less. Extra salt intake was reported if the individual used extra salt at meals (8, 9).

Physical activity was measured using the short version of the International Physical Activity Questionnaire (IPAQ), with a weekly recall (10). A physical activity score was calculated by adding the weekly time spent performing moderate-intensity activities to twice the weekly time spent devoted to vigorous-intensity activities. The scores were categorized into four groups: 0 minutes per week: inactive; 1-149 minutes per week: insufficiently active; 150-999 minutes per week: sufficiently active; ≥1000 minutes per week: highly active. The two least active groups did not meet predetermined physical activity requirements, which mandate at least 150 minutes per week of moderate-intensity physical activity (11).

Risk of coronary heart disease (CHD) for individuals within 10 years was calculated using FRS data (12). Individuals with a clinical diagnosis of CVD (such as heart failure, Myocardial Infarction and/or stroke) were not included in this calculation. According to FRS, risks were specified as follows: <10% "low", 10-20% "medium" and >20% "high".

Training materials

In the first stage of the study, public training materials about cardiovascular disease were distributed. The training materials were of five types.

The first material was the ESKAP Project Participation Form, where all measurement results and FRS ratings were recorded. This form was similar to children's vaccination cards in terms of size and was identified by the names of the individuals. Second, we distributed brochure (13) listing information that we wanted the public to know about heart disease. The brochure had such titles as "CVD, let us protect our hearts, the importance of blood pressure in preventing heart diseases, quit smoking for your health, weight watching, nutrition, food to avoid in CVD" etc. The third training document was a letter in the form of a prescription, which contained the following information: the participant's name; the risk factors established at the first stage of the study; and the suggested measures to protect against these risk factors. The fourth training document was separately prepared as a measuring tape for women and men in different colors to measure waist circumference (marked as ≥88 cm for women and as ≥102 cm for men). The fifth material was a key holder, on which was written, "Your Cardiac Health is in Your Hands". The key holder was in the shape of a heart, in order to remind participants of the project.

Statistical analysis

All statistical analyses were performed using SPSS 13.0 for Windows (SPSS, Inc., Chicago, USA). As a result of the normality test, data was found to be normally distributed ($p>0.05$). In the evaluation of the data the Pearson Chi-square and Student's t-test for independent samples, Mc-Nemar Chi-square and the paired t-test for dependent samples were applied.

An adjustment was made to the post-intervention differences with regard to CVD risk factors to eliminate the effects of age, gender and pre-intervention values for all participants.

A linear regression was used to obtain an adjusted p value in the analysis of the measured values, and logistic regression analysis was used to obtain an adjusted p value in the analysis of qualitative values.

Results

The second phase of the study focused on a total of 778 people, who were all 20-69 years old; the average age was 43.9±12.3 years (control group: 44.1±11.9 years; intervention group: 43.2±12.0 years; p=0.108). We enrolled 349 (44.9%) males and 429 (55.1%) females (p=0.006), of which 404 (51.9%) individuals lived in the control area and 374 (48.1%) individuals lived in the intervention area.

For the 778 individuals who participated in the second phase of the study, the change in both areas was analyzed before and after the intervention.

After the project, we concluded that, in the intervention area, there was a significant decrease in smoking, excessive consumption of salt and meat, and the consumption of unsuitable vegetables, fruit and oil. In addition, the number of participants who had a sedentary lifestyle decreased in the intervention area (p<0.001). In the control area, there was a decrease in the consumption of unsuitable vegetables and fruit and an increase in the number of people who lived a sedentary lifestyle (p<0.001) (Table 1).

Although there was an increase in the BMI, waist-hip size, triglyceride level and systolic and diastolic blood pressure averages in the control area (p<0.001), a decrease was observed in the equivalent data (except for the diastolic blood pressure) in the intervention area (p<0.001) (Table 2).

Although there was a significant increase in relation to TG average in the control area (p<0.001), a decrease was detected with regard to total-C level and an increase was detected in HDL-C level in the intervention area (p<0.001) (Table 3).

Any positive change in the risk factors was considered to be stronger in the intervention area. According to the change between two groups the adjusted p values for age, gender, first phase results, and diagnosed CVD were significant for most of the risk factors. However for oil consumption (p=0.993), hip circumference (p=0.349) and blood-glucose averages (p=0.951) the adjusted p value was not significant (Tables 1, 2, 3).

According to FRS data collected after the second phase, there was a decrease of 15.4% in males (p<0.001) and 10.2% in females (p<0.001) in the intervention area and an increase of 8.2% in males (p=0.011) and 3.8% in females (p=0.078) in the control area (Fig. 2).

Table 1. Changes in the control and intervention areas with regard to the risk factors after the intervention

Variables	Control (n=404)	Intervention (n=374)	p** ΔControl/ ΔIntervention
Active smoker rate, n (%)			
Starting value	92 (22.7)	145 (38.7)	<0.001
After the training	86 (21.3)	110 (29.4)	
Change	-1.4	-9.3*	
Inappropriate salt consumption, n (%)			
Starting value	84 (20.8)	80 (21.4)	<0.001
After the training	93 (23.0)	23 (6.1)	
Change	+2.2	-15.3*	
Inappropriate red meat consumption, n (%)			
Starting value	59 (14.6)	33 (8.8)	<0.001
After the training	54 (13.4)	7 (1.9)	
Change	-1.2	-6.9*	
Inappropriate vegetable/ fruit consumption, n (%)			
Starting value	124 (30.7)	148 (39.6)	<0.001
After the training	111 (27.5)	95 (25.4)	
Change	-3.2*	-14.2*	
Inappropriate oil consumption, n (%)			
Starting value	45 (11.1)	28 (7.5)	0.993
After the training	45 (11.1)	2 (0.01)	
Change	0.0	-7.5*	
Sedentary lifestyle rate, n (%)			
Starting value	264 (65.3)	170 (45.5)	<0.001
After the training	303 (75.0)	118 (31.6)	
Change	+10.3*	-13.9*	

Data are presented as number (percentage)
*Mc-Nemar Chi-square test - p<0.001 change that occurred after the intervention
**Pearson Chi-square test - the difference in the change between the groups was adjusted through logistic regression based on age, gender, first phase results, and diagnosed CVD Δ Change
CVD - cardiovascular disease

Discussion

With this study the intervention raised awareness of people in terms of CVD risk factors and promoted related heart-healthy behaviors. After the project, it was found that in the intervention area, there was a significant decrease in smoking, inappropriate nutrition habits, blood lipid levels and the number of persons who live sedentary.

In Turkey, community-based CVD programs have recently been proposed. The ESKAP project is one of the first community-based protection programs in our country.

This project was intervention-based and was planned as a quasi-experimental CVD study. The study was carried out in two semi-rural areas (a control area and an intervention area) that are each similar distances from the city centre. These two semi-rural areas were chosen for ease of sampling; this design

Table 2. Changes with regard to measureable risk factors in the control and intervention areas after the intervention

Variables	Control (n=404)	Intervention (n=374)	p** ΔControl/ ΔIntervention
BMI, kg/m^2			
Starting value	28.41±5.58	27.96±5.64	<0.001
After the training	29.11±5.63	27.70±5.39	
Change	+0.7*	-0.3*	
Waist circumference, cm			
Starting value	89.20±11.85	91.15±11.15	<0.001
After the training	89.81±11.82	90.79±11.03	
Change	+0.6*	-0.4*	
Hip circumference, cm			
Starting value	107.89±11.41	107.29±10.10	0.349
After the training	108.42±11.27	106.82±9.89	
Change	+0.5*	-0.5*	
Systolic blood pressure, mmHg			
Starting value	124.68±20.88	122.19±19.39	<0.001
After the training	135.76±21.67	120.56±14.26	
Change	+11.1*	-1.6*	
Diastolic blood pressure, mmHg			
Starting value	79.45±13.97	77.28±13.10	<0.001
After the training	87.28±11.05	76.69±9.75	
Change	+7.8*	-0.6	

Data are presented as mean ±SD
*paired t test, p<0.001 for change that occurred after the intervention
** Student's unpaired t-test - difference in the change between the groups was adjusted through linear regression based on age, gender, first phase results, and diagnosed CVD Δ Change
BMI - body mass index, CVD - cardiovascular disease

Table 3. Changes with regard to blood biochemistry values in the control and intervention areas after the intervention

Variables	Control (n=404)	Intervention (n=374)	p** ΔControl/ ΔIntervention
Total-C, mg/dl			
Starting value	188.03±37.03	181.99±40.55	<0.001
After the training	194.65±37.25	178.76±37.77	
Change	+6.6	-3.2*	
HDL-C, mg/dl			
Starting value	46.34±10.82	46.81±9.88	0.046
After the training	46.24±11.25	47.71±12.09	
Change	-0.1	+0.9*	
LDL-C, mg/dl			
Starting value	118.65±33.09	116.58±36.09	<0.001
After the training	125.69±32.56	117.76±31.86	
Change	+7.0	+1.2	
TG, mg/dl			
Starting value	143.96±91.28	147.59±85.22	<0.001
After the training	157.65±85.55	144.31±74.48	
Change	+13.7*	-3.3	
Glucose, mg/dl			
Starting value	98.08±91.16	92.01±27.42	0.951
After the training	96.16±30.46	90.87±15.99	
Change	-1.9	-1.1	

Data are presented as mean ±SD
*paired t test, p<0.001 for change that occurred after the intervention
** Student's unpaired t-test - difference in the change between the groups was adjusted through linear regression based on age, gender, first phase results, and diagnosed CVD Δ Change
CVD - cardiovascular disease, HDL-C - high density lipoprotein cholesterol, LDL-C - low density lipoprotein cholesterol, TG - triglycerides, total-C - total cholesterol

worked because our study ignored changes in morbidity and mortality, which are long-term effects of such interventions.

Previous studies e.g., North Karelia (14), Minnesota (15), Stanford (16) and Pawtucket (17) which included wide-scale CVD intervention, indicated reducing risk factors for CVD; however, there were limitations in establishing significant differences by comparison with control communities. As the same impact was not observed in the small-scale rural area studies within the study period, it may be preferable to investigate the effects of intervention across society (18). South Africa (19), America-Missouri (20) and Sweden (21) studies are successful examples of such an approach.

Although minor effects can be detected with community-based prevention programs, CDC and the WHO suggest that the community-based prevention programs should be supported as they may create greater reflections at the community level (2, 3).

Community-based intervention methods in this study were as follows: risk factor scanning; promotion of FRS (which determines the risk of CHD within the next 10 years through an individual, face-to-face method); distribution of two separate training materials in the intervention group; referral of high-risk individuals to their family doctors; and advising participants of their risk factors through phone calls. Intervention in this study included health promotion methods at the individual level, rather than environmental and political changes. As specified by Fishbein, the aims of community intervention studies should generally focus on changing behaviors (22).

We think that the various practices used in the intervention area created sufficient awareness about CVD. The inclusion of sections such as "healthy nutrition" and "beware of stress" in the distributed brochure helped the public to make better diet choices. We recorded a decrease in systolic blood pressure and improved blood lipid profiles.

Construction of sports parks by the municipality took place within the intervention period in both areas. While there was an increase in physical activity and a decrease of 0.3 kg/m^2 in relation to BMI in the intervention area, the opposite shift occurred in the control area. Decreases related to the risk factors in the intervention area were reflected in the FRS and a decrease of 12.8% was detected in individuals with a risk above 10%.

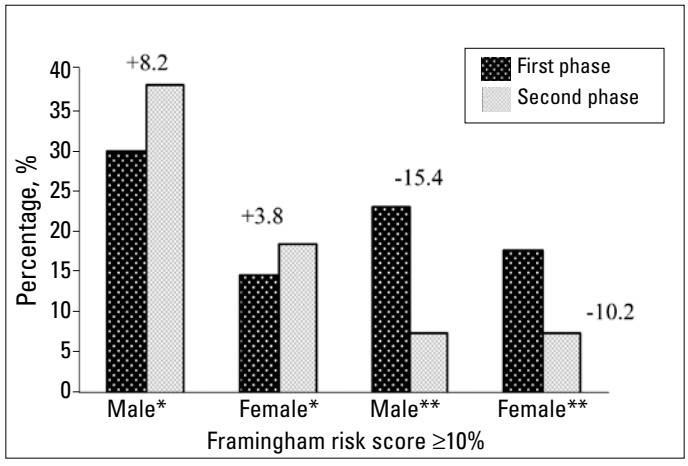

Figure 2. Percentage change at first and second phase in Framingham Risk Score (FRS) in intervention and control areas
*Control area, **Intervention area

The most limited changes achievable through community-based programs may be improving physical activity levels and decreasing obesity. Difficulties in modifying these two risk factors, as well as the fact that they are affected by many other factors, may play a role here (23).

Studies on controlling cardiovascular risks are plentiful, with national media campaigns, training materials, conferences, behavior change-specific programs and public march programs being examined. It is a known fact that public health training endeavors related to cardiovascular diseases expand the awareness and knowledge of risk factors (24, 25).

Although the effect of general lifestyle modifications on reducing risk factors is moderate, this effect may become apparent in a cumulative way after the intervention. The cumulative effects of decreases in blood pressure, smoking cessation and serum total-C and increases in HDL-C suggested an overall decrease in our participants, who reported 10-year FRS scores equal to and above, 10% (26, 27).

In a community-based program implemented in India over four years, it was reported that, after the intervention, the number of individuals who had a 10% or higher FRS risk significantly decreased in the intervention area but increased in the control area (28). Richardson et al. (29) was reported, which was implemented in order to mitigate CHD, cards with FRS values were distributed, and one year later the ten-year risk had seemingly decreased by 6.7% in the study group. However, one of the limitations of this study is the fact that there was no control group.

Hu et al. (30) reported that risk levels might be reduced through consultative services for individuals with low and high FRS and through programming on lifestyle change.

Strategies that aim to address multiple risk factors simultaneously will also be effective in treating other chronic diseases like coronary heart disease, stroke and diabetes over time. In the long term, support of these programs by senior management and qualified personnel will increase the success of these programs.

Study limitations

There were more female participants in this study than male participants, as in other field studies carried out in Turkey. In addition, the study suffered from the same limitations as other quasi-experimental designs. Because it was impossible not to make any interventions with the control group, and because no basic examination was performed, the FRS was promoted within this group.

In addition to our interventions, the "Law on Prevention of Hazards with Regard to Tobacco Products" entered into force in our country in 2009, which also decreased the number of smokers in the intervention and control areas.

While the measurements made in both areas employed the same methods and standard equipment, some risk factors such as physical activity were evaluated based on personal statements and thus may not reflect the actual situation. However, this issue is an unavoidable consequence for every study.

In this study, effects of more than one intervention were evaluated.

Conclusion

This study suggests that screening individuals who are older than twenty years of age for CVD risk factors, notifying such individuals of their status related to risk factors within ten years and offering educational services on cardiac health may be effective methods in decreasing CVD risk factors.

The public should be informed about FRS; however, it should be ensured that the public should adopt the requirements of information on the subject and mitigation of the risk through social and individual training practices.

In conclusion, the ESKAP project may be integrated into primary healthcare services within the province. This program may serve as an example to other community-based programs in Turkey and it should be scaled up accordingly.

Conflict of interest: None declared.

Funding

The study was funded by the Research Foundation of Eskişehir Osmangazi University, Eskişehir, Turkey (study registration code 2009/252).

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