

# Prevention and Control Program for Cardiovascular Diseases in Turkish Population

## PRE-CONTROL Study Group

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### ABSTRACT

**Background:** Cardiovascular disease (CVD) is the leading cause of death throughout the world. Despite its high prevalence, the atherosclerotic process can be slowed and its consequences markedly reduced by preventive measures. The lack of risk factor awareness is a major barrier.

**Objectives:** We aimed to assess total CV risk, determine the knowledge and awareness regarding CVD, and evaluate the effectiveness of education program in urban population of Turkey.

**Methods:** A 24-item questionnaire was used to detect CV risk factors and the awareness of participants about CVD. The feedback data for the education program were collected by either questionnaires or individual interviews with participants. For comparison of total CVD risk in men and women in different age groups, a sample *t* test was used. The level of statistical significance was set at  $p < 0.05$ .

**Results:** The prevalence of hyperlipidemia was established to be 41.3%. Nearly one-quarter of the women and one-third of the men were smokers ( $p < 0.001$ ). One-quarter of the responders had a history of hypertension (men: 21.5%, women: 18.6%), and one-tenth were diabetic. The high CV risk rate was more pronounced among men ( $p < 0.01$ ) and those with low socioeconomic level ( $p < 0.01$ ). Awareness regarding CV risk factors following the educational program increased from 6.6% to 12.7% for high blood pressure, from 3.9% to 9.2% for diabetes mellitus, and from 10.2% to 15.1% for elevated cholesterol levels. All the increases were statistically significant. The educational program significantly increased the awareness of CVD and risk factors.

**Conclusions:** The prevalence of CV risk factors was higher in low socioeconomic level groups. The knowledge and awareness of the risk factors for CVD before the education program was very low in our study group. The awareness of CVD and risk factors significantly increased following our education programs.

Cardiovascular diseases (CVD) are the number 1 cause of death in both developed and developing countries, and 80% of the deaths occur in low- and middle-income countries [1]. By 2030, almost 23.6 million people will have died from CVD throughout the world, and the increase in coronary heart disease (CHD) mortality in the developing countries is expected to be much greater than it is in the developed countries (48% and 29%, respectively) [2,3]. CVD also is the predominant cause (~50%) of overall deaths in the Turkish population. It is estimated that the number of deaths will have nearly doubled by 2030 [4]. The majority of CV events are predictable. The predominant form of CVD is CHD, and well-defined risk factors are hypertension, obesity, diabetes, and dyslipidemia. However, the lack of risk-factor awareness is a major barrier in the management of CVD. The risk factor awareness is an important step for improving risk factor modification and population-based prevention of CVD.

In this study, we aimed to: 1) assess total CV risk; 2) determine the knowledge and awareness of participants about CVD; and 3) evaluate the effectiveness of a prevention education program on the awareness of CVD in the urban population of Turkey.

### METHODS

The study was conducted at 10 municipalities of the 3 metropolitan cities in Turkey. Because all ethnic groups are represented in the metropolitan cities in Turkey, the study population is a good representation of the overall Turkish population. The municipalities announced the study on their web pages and on billboards. The people who showed up on the seminar day were recruited.

The municipalities made announcements regarding the education seminars 2 weeks ahead of the planned date. Seminars were held in town halls and were 1-day events. Slide presentations of CV risk factors were done by

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physicians who were members of the Turkish Society of Cardiology. Five presentations were given in the educational program. The topics included CVD (introduction, risk factors), hypertension, hyperlipidemia, obesity, and diabetes mellitus.

A 24-item questionnaire form was used for detecting CV risk factors and the awareness of participants about CVD. The questionnaire was formed by physicians who were members of the Turkish Society of Cardiology. It included questions about personal and family history of disease, education level, lifestyle factors, and medications. Blood pressures were measured and necessary blood samples for risk management were taken at the beginning of seminars. The education and socioeconomic levels of participants were categorized into 3 groups: 1) low (primary school and below high school); 2) intermediate (high school or apprenticeships); and 3) high (bachelor degrees or higher). Definition of risk factors are as follows: hypertension ( $\geq 140$  systolic or  $\geq 90$  diastolic or on anti-hypertensive medication); diabetes ( $\geq 126$  mg/dl fasting glucose or  $\geq 200$  casual glucose or on antidiabetic medication). The Joint British Societies' CVD risk prediction risk chart was used for investigating the CV risk levels (low risk:  $< 10\%$ ; intermediate risk:  $10\%$  to  $20\%$ ; high risk:  $> 20\%$ ) of the participants [5]. CV risk calculation was not performed for the CHD group and for people within the high-risk group.

The education program's feedback data were collected by questionnaires and individual interviews of the participants after 2 weeks of education seminars by telephone surveys.

### Statistical analysis

Data were analyzed using descriptive statistics, and statistical analyses were evaluated using the SPSS (version 13.0 for Windows, IBM Corporation, Armonk, NY, USA) program. For all measures, the distribution of results was presented as mean  $\pm$  SD. The level of statistical significance was set at  $p < 0.05$ . For comparison of total CVD risk in men and women and in different age groups, a sample *t* test was used. The association of heart disease and CV risk awareness and lifestyle habit was analyzed by using the chi-square test. Multivariate logistic regression was used to examine the association between heart disease awareness and education. In order to compare the CVD risk factor awareness pre- and post-educational program, Pearson chi-square test was used.

### RESULTS

A total of 6,358 participants—ages 30 to 70 years—attended the seminars. The risk measurement chart was completed by 3,355 participants (mean age:  $48.5 \pm 8.6$  years, men: 51.8%). Of these participants, 640 (mean age:  $49.7 \pm 10.3$  years, men: 43.1%) agreed to take a post-education questionnaire. Regarding risk factors and demographics, this group was not statistically different

from those who did not participate in the post-education survey ( $p > 0.05$ ).

The educational level of one-half of the participants was high school or university. Among the major risk factors for CVD, the prevalence of hyperlipidemia was the highest (41.3%) in participants (men: 30%, women: 48.5%;  $p < 0.001$ ) (Table 1). Of the participants, 34.9% had a family history for heart disease. Nearly one-quarter of the women and one-third of the men were smokers ( $p < 0.001$ ). The prevalence of smoking was higher in high school graduate participants ( $p < 0.001$ ). One-quarter of the responders had a history of hypertension (men: 21.5%, women: 18.6%), and one-tenth were diabetic. The prevalence of hypertension was higher in the participants  $> 55$  years (55 to 64 years age range: 30.2%, 65 to 69 years age range: 32.4%). The presence of hypertension was significantly higher in the subjects with low socioeconomic levels ( $p < 0.01$ ). The prevalence of diabetes was higher in women, and 40% had high cholesterol ( $> 200$  mg/dl) levels. The presence of CHD was similar for both sexes (men: 9%, women: 10%). However, the presence of CHD was higher in the participants with low socioeconomic levels (11.1%,  $p < 0.01$ ). Among those over 55 years of age, the prevalence of diabetes mellitus and CHD was doubled for each sex ( $p < 0.001$ ). Every 1 of 4 participants over age 65 years had CHD. Furthermore, 10% of the population had cerebrovascular disease, and the prevalence was higher in the women (men: 8.5%, women: 12.7%;  $p < 0.001$ ).

Twenty-nine percent of all participants (men: 36.7%, women: 20.7%) had high CV risk, and this prevalence was up to 70% for the sixth decade ( $p < 0.01$ ). The high CV risk prevalence was more pronounced in men ( $p < 0.01$ ), and subjects with low socioeconomic levels ( $p < 0.01$ ). The prevalence of hypertension was 22.8% in the intermediate-risk group and 35.6% in the high-risk one. Hypercholesterolemia was detected in one-half of both intermediate- and high-risk scored groups.

The responders' knowledge of CV risk factors was low, and, unfortunately, 8.8% of the subjects could not identify even a single risk factor. Only 21% of the participants with

**TABLE 1.** Distribution of cardiovascular risk factors by sex among the study population

Risk factors for CHD	Men, % (n = 1,737)	Women, % (n = 1,618)
Hyperlipidemia, TC >200 mg/dl	30	48.5
Family history	30.3	39.8
High blood pressure, >140/90 mm Hg	21.5	18.6
Tobacco smoking	34.6	24.2
Diabetes mellitus	10.4	13.6
TC, total cholesterol.		

**TABLE 2.** The effect of prevention educational program on the rate of awareness of participants about CVD (n = 640)

Awareness of CV Risk Factors	Before Educational Program, %	After Educational Program, %	Pearson Chi-Square*
High blood pressure			
Mentioned	6.6	12.7	0.002
Not mentioned	93.4	87.3	
Diabetes mellitus			
Mentioned	3.9	9.2	0.002
Not mentioned	96.1	90.8	
High cholesterol			
Mentioned	10.2	15.1	0.049
Not mentioned	89.8	84.9	
Family history			
Mentioned	0.3	18.3	0.000
Not mentioned	99.7	81.7	
Obesity, overweight			
Mentioned	15.2	20.8	0.033
Not mentioned	84.8	79.2	
Tobacco smoking			
Mentioned	45.6	55.6	0.003
Not mentioned	54.4	44.4	
Physical inactivity			
Mentioned	15.5	33.4	0.000
Not mentioned	84.5	66.6	
Stress, psychosocial factors			
Mentioned	28.9	38.0	0.042
Not mentioned	71.1	62.0	

CV, cardiovascular; CVD, cardiovascular disease(s).  
\*Shows significance level (2-sided).

CV risk score >10% had visited a physician within the previous year. Up to 90% of the participants responded that they were very well or well informed about CVD. The programs were found to be beneficial by 91.1% of the participants. According to the results of the post-education survey, the awareness of CVD and risk factors was observed to have increased significantly. The increased awareness regarding CV risk factors following the educational program went from 6.6% to 12.7% for high blood pressure, from 3.9% to 9.2% for diabetes mellitus, and from 10.2% to 15.1% for elevated cholesterol levels. Similarly, increased awareness was observed in the number of people regarding tobacco smoking (from 45.6% to 55.3%) and physical inactivity (15.5% to 33.4%) as CV risk factors. All the increases were noted to be statistically significant (Table 2). Of the participants, 94.7% consulted a physician regarding the management of their CV risk profiles after the education program.

## DISCUSSION

The atherosclerotic process can be greatly slowed down and its consequences markedly reduced by preventive measures [6]. A number of countries have instituted educational methods to encourage people to reduce their risks for developing heart disease. INTERHEART (Effect of

Potentially Modifiable Risk Factors Associated with Myocardial Infarction in 52 Countries), a global case-control study of risk factors for acute myocardial infarction, identified 9 risk factors, among which dyslipidemia was the most common (49%) risk for a first myocardial infarction [7].

In our study, the most common CV risk factor among the participants was hyperlipidemia. In a study carried out in Bulgaria, 48.7% of the participants were in the high-risk group [8]. In 2005, a survey for CV risk factors was performed in Romania: 20.7% of the subjects had a high risk, and the prevalence of hypercholesterolemia as a CV risk factor was 40% [9]. The prevalence of being overweight and obese as CV risk factors has been increasing in the Asia-Pacific region as a consequence of economic development [10,11].

The prevalence of CV risk factors was higher in the low socioeconomic level groups in our study. Of the participants, 90.8% had higher than secondary education in the Bulgarian study, which could explain the different prevalences of high-risk subjects between the 2 studies [8]. Recent reports from Italy [12] and the Czech Republic [13] showed that socioeconomic status is significantly associated with regular monitoring of risk factors for CVD. The same relationship is reported for developing countries. The CVD mortality in South Asian men is significantly higher

than it is in their European counterparts, and there is a positive correlation between the level of education and acute myocardial infarction [14].

There are 3 strategies for CVD prevention: population-based; high-risk; and secondary-prevention. The high-risk primary prevention strategies are focused on healthy subjects with high absolute risks of future CVD, and the secondary prevention strategies are based on patients with known atherosclerotic diseases. The aim of population strategy is to reduce the incidence and the burden of CVD in the entire population. Although these have different advantages and disadvantages, the common target is to reduce total CV risk through lifestyle interventions, management of risk factors, and the use of cardioprotective drugs [15–17]. In all models, the patients should be aware of their risk for CVD. Despite the recommendations, many Americans do not know their cholesterol levels or blood pressure, as shown by the results of the National Health and Nutrition Examination Survey. For instance, 40% of subjects with high cholesterol levels were aware of their levels [18]. The lack of risk factor awareness is an important barrier to diagnosis and treatment. Therefore, the education of the patient remains essential for optimal health care. According to the results of the U.S. Framingham Offspring Study, a higher educational status was significantly associated with lower prevalence of CHD [19]. The same problem has been shown for European countries. A study investigating the populations of 5 European countries (France, Germany, Italy, Sweden, and the United Kingdom) reported the lack of awareness of the risks of CHD in Europe. Awareness and knowledge of low- and high-density lipoprotein cholesterol were poor in all these countries; only 9% of them reported that they were currently taking medication for high cholesterol and 20% for hypertension [20]. The EURIKA (European Study on Cardiovascular Risk Prevention and Management in Usual Daily Practice) study represented that CVD risk factors remain uncontrolled in a large proportion of patients in Europe. However, up to 135,000 deaths could be prevented each year through better control of CV risk factors [21,22].

Fernandez et al. [23] reported that only one-third of participants recognized all 6 modifiable risk factors (diabetes, hypertension, high cholesterol, smoking, physical inactivity, overweight) in New South Wales, Australia. And one-third of those with documented diabetes did not recognize this condition as a risk factor for heart disease. In our community, although the CV risk was high (moderate- or high-risk rate was 74.6%), the knowledge and awareness of the risk factors for CVD was very low. The EUROASPIRE III (European Action on Secondary and Primary Prevention by Intervention to Reduce Events) study showed that healthcare professionals gave inadequate information to their patients after a CV event in Turkey [24]. The awareness of CVD and risk factors was significantly increased following our education programs.

Public educational health programs targeting education and awareness of CVD risk factors are imperative for preventing or controlling CVD. The results of the Stanford Five-City Project showed that community health educations appeared to make a significant change in CV event rates in the years after the intervention was completed [25].

Furthermore, we are aware of the fact that even though health education is crucial for promoting health, as a number of studies have demonstrated, the level of knowledge is not enough to change the lifestyles and attitudes of the individuals. Different behavioral models and social learning theories are used to change the behaviors of the individuals and populations are crucial for health promotion and healthy lifestyles besides education.

### Study limitations

Of 6,358 participants, nearly one-half completed the risk chart evaluation, and 640 responded to the post-education survey. The weights of the participants were not recorded because we focused only on the parameters of the 10-year CV risk assessment chart.

### CONCLUSIONS

The results indicate that regardless of the level of the risk for CVD, knowledge and awareness of the risk factors for CVD was low in our Turkish community. Community-based educational programs are helpful in increasing public awareness, health promotion, and better management of CVD. We should organize public health campaigns to raise awareness. Moreover, besides education, we should work on different behavioral models and social learning theories to change the behaviors of individuals and populations, which is crucial for health promotion and healthy lifestyles.

### REFERENCES

1. Gaziano TA, Bitton A, Anand S, Abrahams-Gessel S, Murphy A. Growing epidemic of coronary heart disease in low- and middle-income countries. *Curr Probl Cardiol* 2010;35:72–115.
2. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001;104:2746–53.
3. Murray CJL, Lopez AD, editors. *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020*. Boston, MA, USA: Harvard School of Public Health; 1996.
4. T.C. Sağlık Bakanlığı, Temel Sağlık Hizmetleri Genel Müdürlüğü [Ministry of Health of Turkey, Directorate General, Primary Healthcare Services]. Türkiye Kalp ve Damar Hastalıklarının Önleme ve Kontrol Programı [Prevention and Control Program for Cardiovascular Diseases] [pdf]. Available at: <http://www.saglik.gov.tr/TSHGM/dosya/1-42862/h/strategicactionplan.pdf>. Accessed 2009.
5. British Cardiac Society; British Hypertension Society; Diabetes UK; HEART UK; Primary Care Cardiovascular Society; Stroke Association. JBS 2: Joint British Societies' guidelines on prevention of cardiovascular disease in clinical practice. *Heart* 2005;91(Suppl 5):V1–52.
6. Smith SC Jr, Jackson R, Pearson TA, et al. Principles for national and regional guidelines on cardiovascular disease prevention: a scientific

- statement from the World Heart and Stroke Forum. *Circulation* 2004; 109:3112–21.
7. Yusuf S, Hawken S, Ounpuu S, et al, for the INTERHEART Study Investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004;364:937–52.
  8. Dyakova M, Shipkovenska E, Dyakov P, Dimitrov P, Torbova S. Cardiovascular risk assessment of Bulgarian urban population: cross-sectional study. *Croat Med J* 2008;49:783–91.
  9. Dorobantu M, Bădilă E, Ghiorghe S, Darabont RO, Olteanu M, Flondor P. Total cardiovascular risk estimation in Romania. Data from the SEPHAR study. *Rom J Intern Med* 2008;46:29–37.
  10. Sasayama S. Heart disease in Asia. *Circulation* 2008;118:2669–71.
  11. Asia Pacific Cohort Studies Collaboration. The burden of overweight and obesity in the Asia-Pacific region. *Obes Rev* 2007;8:191–6.
  12. Damiani G, Federico B, Bianchi CB, et al. Socio-economic status and prevention of cardiovascular disease in Italy: evidence from a national health survey. *Eur J Public Health* 2010;21:591–6.
  13. Bobak M, Hertzman C, Skodova Z, Marmot M. Socioeconomic status and cardiovascular risk factors in the Czech Republic. *Int J Epidemiol* 1999;28:46–52.
  14. Ramaraj R, Chellappa P. Cardiovascular risk in South Asians. *Postgrad Med J* 2008;84:518–23.
  15. World Health Organization. Prevention of Coronary Heart Disease. Report of a WHO Expert Committee. WHO Technical Report Series 678. Geneva, Switzerland: World Health Organization; 1992.
  16. Graham I, Atar D, Borch-Johnsen K, et al, for the ESC CPG. European guidelines on cardiovascular disease prevention in clinical practice: full text: executive summary: Fourth Joint Task Force of the European Society of Cardiology and other Societies on cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). *Eur Heart J* 2007;28:2375–414.
  17. Franklin BA, Cushman M. Recent advances in preventive cardiology and lifestyle medicine: a themed series. *Circulation* 2011;123:2274–83.
  18. Ford ES, Mokdad AH, Giles WH, Mensah GA. Serum total cholesterol concentrations and awareness, treatment, and control of hypercholesterolemia among US adults: findings from the National Health and Nutrition Examination Survey, 1999 to 2000. *Circulation* 2003;107: 2185–9.
  19. Loucks EB, Sullivan LM, Hayes LJ, et al. Association of educational level with inflammatory markers in the Framingham Offspring Study. *Am J Epidemiol* 2006;163:622–8.
  20. Erhardt L, Hobbs FD. Public perceptions of cardiovascular risk in five European countries: the react survey. *Int J Clin Pract* 2002;56: 638–44.
  21. Banegas JR, López-García E, Dallongeville J, et al. Achievement of treatment goals for primary prevention of cardiovascular disease in clinical practice across Europe: the EURIKA study. *Eur Heart J* 2011; 32:2143–52.
  22. Guallar E, Halcox JP, Dallongeville J, et al. The European Study on Cardiovascular Risk Prevention and Management in Daily Practice. Poster P120. Presented at: EuroPrevent; April 14–16, 2011; Geneva, Switzerland.
  23. Fernandez RS, Salamonson Y, Griffiths R, Juergens C, Davidson P. Awareness of risk factors for coronary heart disease following interventional cardiology procedures: a key concern for nursing practice. *Int J Nurs Pract* 2008;14:435–42.
  24. Tokgözoğlu L, Kaya EB, Erol C, et al, for the EUROASPIRE III Turkey Study Group. [EUROASPIRE III: a comparison between Turkey and Europe]. *Turk Kardiyol Dern Ars* 2010;38:164–72.
  25. Fortmann SP, Varady AN. Effects of a community-wide health education program on cardiovascular disease morbidity and mortality: the Stanford Five-City Project. *Am J Epidemiol* 2000;152: 316–23.