# THE PREVALENCE OF CORONARY ARTERY DISEASE ACCORDING TO ROSE QUESTIONNAIRE AND ECG: ISFAHAN HEALTHY HEART PROGRAM (IHHP)

**M Sadeghi MD[(1)], H Ruhafza MD[(2)], Sh Shirani MD[(3)]**
**A Akhavan Tabib MD[(4)], P Aghdak MD[(5)], Sh Hosseini[(6)]**

## Abstract

**INTRODUCTION:** Cardiovascular diseases and coronary artery disease (CAD) in particular are the main cause of morbidity and mortality in Iran. This study was designed to determine the prevalence of CAD in Central Iran using the Rose Questionnaire and Electrocardiography.

**METHODS:** 6498 people aged above 35 years were studied in this cross-sectional study. Multi-stage cluster sampling was conducted in the cities of Isfahan, Najaf-Abad and Arak. A questionnaire was used to collect demographic and job data. The Rose chest pain questionnaire containing five questions was filled out by trained physicians. ECG and Minnesota coding were performed. Data was analyzed with chi-square test using SPSS 11.

**RESULTS:** 3338 women and 3160 men participated in the study. The prevalence of CAD based on the Rose questionnaire and Minnesota coding was 37.5% in women and 22.2% in men. The prevalence of CAD increased with age in both sexes. The prevalence of definite and possible MI based on ECG was higher in men; however, a higher prevalence of possible and definite ischemia was found in women. The prevalence of CAD based on the Rose questionnaire was higher in women of all age groups.

**CONCLUSIONS:** The high prevalence of CAD in the Iranian community warrants a comprehensive primary and secondary prevention program.

**Key Words:** Coronary artery disease, Rose questionnaire, Minnesota code, ECG, prevalence.

**ARYA Journal, 2006, 2(2): 70-74**

## Introduction

Cardiovascular diseases (CVD) are the most common cause of mortality and morbidity in the West, accounting for more than 50% of all deaths.[1]

Every year, nearly 1.5 million people in the US are affected or debilitated by myocardial infarction (MI).[2]

A similar status quo in terms of mortality and morbidity exists in many developing nations, which account for 80% of CVD-related mortality worldwide.[3] The use of costly and time-consuming diagnostics such as exercise test and angiography are not advisable for epidemiological studies of CVD patients;[4] simpler and less expensive methods have been developed for epidemiological studies of patients with coronary artery disease (CAD).

Minnesota ECG coding is a widely used method used to study CVD the world over.[5] Based on this method, the prevalence of CAD was estimated at 25% in 40-59-year-old English men and 9.6% in Indian men.[6,7]

Another method developed by Rose in 1962 consists of a chest-pain questionnaire which is used to estimate the prevalence of CAD in epidemiological studies.[8] A 1999 study using both above-mentioned methods in the urban areas of Isfahan, Central Iran, estimated the prevalence of CAD at 19.4%.[9] Studies in Iran have documented the growing trend of CAD-related mortality in this country.[10]

Between 2001 and 2003, CAD mortality in Isfahan Province rose from 121.5 to 156.6 per 100,000 population.[11] Given the high mortality and burden of CVD, costly nature of diagnostic methods and shortage of new data, we set out to assess the prevalence of CAD in areas of Central Iran using

(1) Masoumeh Sadeghi MD, Assistant Professor, Cardiologist, Head of CVD in Woman Research Unit
Isfahan Cardiovascular Research Center, PO. Box: 8146-1148. Isfahan, Iran. Email: m_sadeghi@crc.mui.ac.ir
(2) Hamidreza Ruhafza MD, Assistant Professor, Psychologist, Head of Mental Health Research Unit
Isfahan Cardiovascular Research Center
(3) Shahin Shirani MD, Assistant Professor, Cardiologist, Isfahan Cardiovascular Research Center
(4) Afshan Akhavan Tabib MD, Research Assistant, Isfahan Cardiovascular Research Center
(5) Pezhman Aghdak MD, Research Assistant, Isfahan Province Health Center
(6) Shidokht Hosseini BS, Research Assistant, Isfahan Cardiovascular Research Center

*Corresponding author:* Masoumeh Sadeghi
*Date of submission:* December 25, 2005
*Date of acceptance:* February 22, 2006

both methods mentioned above, as part of Isfahan Healthy Heart Program (IHHP), which is a community-based intervention program for non-communicable diseases (NCD) prevention and health promotion. The findings of this study can be used in development of health and treatment policies by relevant authorities.[12]

## Materials and methods

This cross-sectional study was conducted in 2000-2001 as part of the first phase of IHHP, on over-35 individuals of the urban and rural communities of three provincial cities of Isfahan, Najafabad, and Arak. Multistage cluster sampling method was used to enable classification according to sex ration and place of residence.

Inclusion criteria were having more than 35 years of age, absence of hemorrhagic disease and mental retardation, Iranian nationality, and history of residing in the above cities for at least 10 years.[12] Demographic data (sex, age, education, occupation) were obtained by trained interviewers using questionnaires in door-to-door visits. The subjects were asked to go to predetermined therapy centers, where the WHO standard Rose questionnaire would be completed for them by physicians working with the study.[8] The questionnaire contains five questions about the quality of chest pain as follows:

- When is pain experienced? During exertion, normal walking, resting, eating, rage
- If induced by exertion, how long after stopping exertion does pain relief occur?
- Where is pain located? Inferior sternum, superior sternum, left-sided, left hemithorax
- Are there accompanying symptoms? Diaphoresis, nausea, vomiting
- Has here been resting pain, or pain lasting more than half an hour in anterior chest?

Respondents who characterize their angina with the first four questions, i.e. exertion-induced pain relieving within 10 minutes of stopping exertion, located behind the sternum, with no accompanying symptoms were placed in the definite angina group. Respondents with affirmative answer to question five were considered as cases of possible MI, and those with exertion-induced pain but without other characteristics of typical angina as cases of possible angina. The prevalence of CAD based on the Rose questionnaire is based on responses to the above questions.

Twelve-lead ECG was taken by trained individuals using Hewlett-Packard electrocardiographs. The electrocardiograms from the three cities were studied by the same cardiologist and their corresponding Minnesota codes were calculated.[8]

In the Minnesota coding system, definite MI refers to cases with $\frac{Q}{R} \geq \frac{1}{3}$ and Q-wave ≥ 0.03 seconds in anterior and inferior chest leads.

Possible MI is defined as QS pattern in $V_1$, $V_2$ and $V_3$ leads (in the absence of left bundle branch block) and $\frac{1}{5} < \frac{Q}{R} < \frac{1}{3}$ in anterior leads and Q-wave ≥ 0.02 in the inferior leads. Definite cardiac ischemia was defined as flattened or depressed ST segment ≥ 2 mm in the anterior and/or inferior leads; possible ischemia was defined as depressed or flattened ST segment <1 mm and ≥ 0.5 mm in the anterior and/or inferior leads.[5] The prevalence of CAD was determined based on the above-said electrocardiographic changes.

Data were statistically analyzed using SPSS 11. Prevalence was expressed in percentages. Chi-square test was used for comparison of the prevalence of CAD in males and females, and between different age groups. The study received the approval of the Ethics Committee of Isfahan Cardiovascular Research Center

## Results

A total of 3338 women (51.4%) with a mean age of 50.81±11.09 years, and 3160 men (48.6%) with a mean age of 51.62±11.69 years in three provincial cities of Isfahan, Najafabad and Arak were included in the study. 75% of the study population lived in urban, and 25% in rural areas.

**TABLE 1.** Frequency distribution of age and sex according to age and sex

| *Diagnosis based on:* | Women (CI95%) | Men (CI95%) | P |
|---|---|---|---|
| Only based on EKG | 27.89(26.41-29.46) | 15.95(14.67-17.23) | 0.00 |
| Only based on Rose questionnaire | 6.1(5.34-6.97) | 5.01(4.28-5.77) | 0.02 |
| EKG and Rose questionnaire | 3.47(2.85-4.90) | 1.56(1.13-2.00) | 0.00 |
| EKG or Rose questionnaire | 37.56(35.91-39.21) | 22.25(21.06-23.98) | 0.00 |

**TABLE 2.** Frequency distribution of CAD based on Rose questionnaire and ECG according to sex

| Age group (years) | Men | Women | Total |
|---|---|---|---|
| | Number (percentage) | Number (percentage) | Number (percentage) |
| 35-39 | 662 (10.2) | 761 (11.7) | 1423 (21.9) |
| 40-49 | 1040 (16.0) | 1157 (17.8) | 2197 (33.8) |
| 50-59 | 658 (10.1) | 656 (10.1) | 1314 (20.2) |
| 60-69 | 536 (8.2) | 576 (8.9) | 1112 (17.1) |
| > 70 | 264 (4.1) | 188 (2.9) | 452 (7.0) |
| Total | 31.6 (48.6) | 3338 (51.4) | 6498 (100) |

Table 1 shows the frequency distribution of subjects according to age and sex. Figure 1 shows the collective prevalence of CAD in men based on questionnaires and Minnesota ECG coding; the prevalence of CAD increased in a linear fashion with age and was higher as judged by ECG than derived from questionnaires.

Figure 2 depicts the prevalence of CAD in women according to questionnaires and ECG; the prevalence of CAD increased with age and was higher as judged by ECG than inferred from questionnaires. Figure 3 shows the prevalence of CAD based on the two methods in men and women. It should be noted that possible and definite ischemia decided based on ECG was higher in women than men in all ages. Possible and definite MI, however, was more prevalent in men ($P<0.05$).

The Rose questionnaire showed the overall prevalence of chest pain to be higher in women than men ($P<0.05$) (not shown).

Table 2 shows the overall prevalence of CAD in men and women based on ECG and Rose questionnaire. CAD was found in both methods to be more prevalent in women than men. In both sexes, the prevalence of CAD determined by ECG was higher than that based on questionnaires ($P<0.05$).

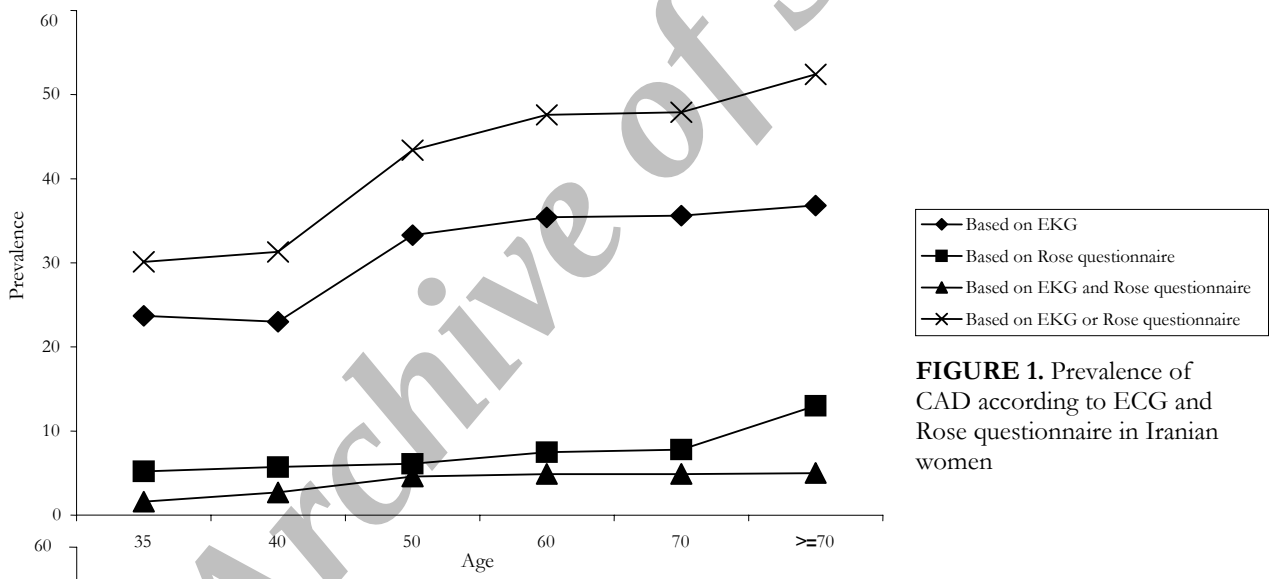


**FIGURE 1.** Prevalence of CAD according to ECG and Rose questionnaire in Iranian women

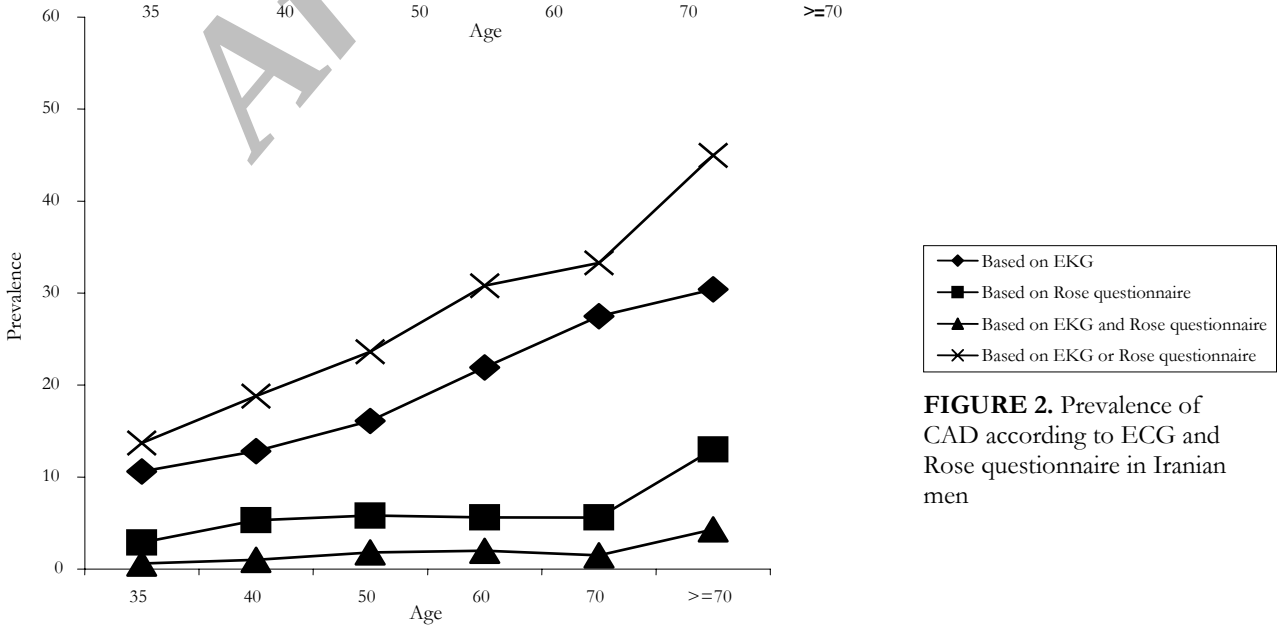


**FIGURE 2.** Prevalence of CAD according to ECG and Rose questionnaire in Iranian men

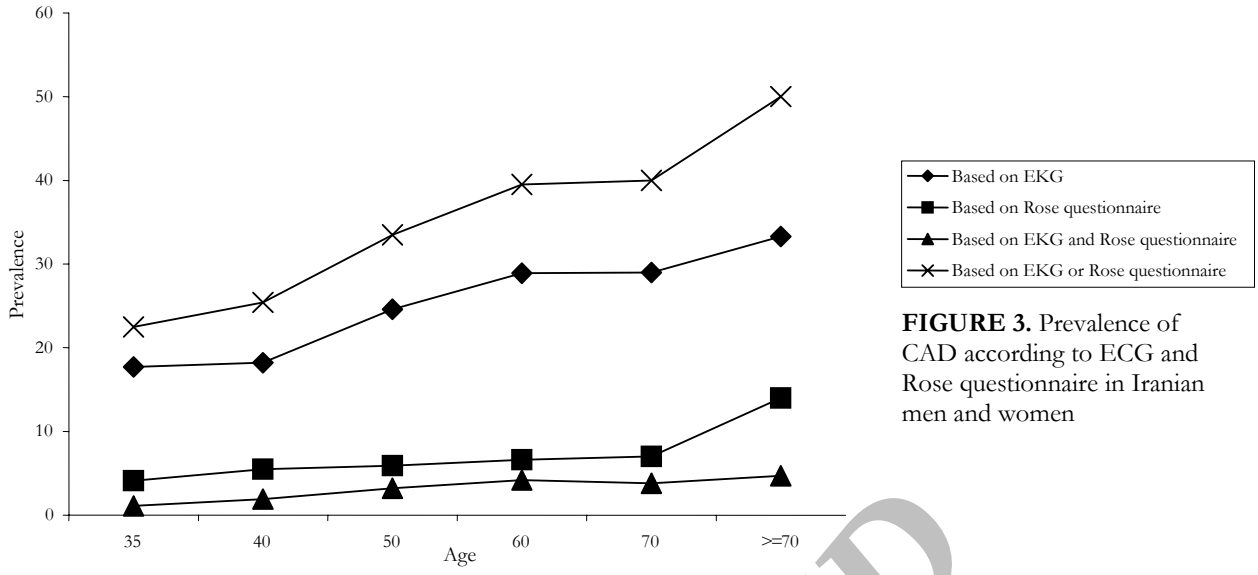


**FIGURE 3.** Prevalence of CAD according to ECG and Rose questionnaire in Iranian men and women

## Discussion

The prevalence of CAD and possible ischemia based on electrocardiographic evidence (Minnesota coding) is significantly higher in women, but definite ischemia, possible MI and definite MI show no difference between the two sexes. Based on the Rose questionnaire, possible chest pain, definite chest pain, and possible MI were significantly more prevalent in women; the prevalence of CAD based on the Rose questionnaire or ECG was 37.5% in women, and 22.2% in men. Comparative study of the prevalence of CAD according to the Rose questionnaire and ECG (Minnesota coding) suggests that chest pain is overlooked or denied in a good number of cases or attributed to non-cardiac causes, hence the Rose questionnaire yields a negative result.[13-15]

On the other hand, the higher prevalence of CAD based on ECG, especially in higher ages, is demonstrative of asymptomatic ECG changes which may be a sign of silent ischemia.[16] A community-based study of 10,000 people in Span using the Rose questionnaire reported the prevalence of CAD at 7.3% in men, and 7.7% in women; this is in concordance with our results which showed CAD to be more prevalent in women.[17]

A study of 10,000 people in Scotland using the Rose questionnaire found the prevalence of ischemic heart disease to be 6.3% and 8.5% in men and women, respectively; this study too, showed a higher prevalence of CAD in women.[18]

A community-based study of over-64 individuals in Finland reported the prevalence of chest pain to be 9.1% in men and 4.9% in women. It reported the prevalence of ischemic ECG changes at 33.9% and 39.3% in men and women, respectively. The high prevalence rates, of course, were due to the subjects' old age.[19]

Based on the two methods in question, the prevalence of ischemic heart disease in Taiwan and India were reported at 21.4% in women and 11.6% in men.[20] Although in line with ours, the latter study is suggestive of the lower prevalence of ischemic heart disease in Southeast and South Asia compared to the West and the population of our study.

Shire designed an extensive study in the UK to assess the prevalence of CAD based on ECG and the Rose questionnaire in men aged 40-59.

He reported ECG changes in 15% and chest pain (possible and definite angina) in 14% of subjects, suggesting the presence of CAD. The low prevalence figures in the latter study can be explained by the exclusion of elderly subjects.[21]

A similar study in Ireland reported the prevalence of all types of ischemic heart disease based on ECG and the Rose questionnaire to be 4% in subjects aged 30-34, and 23% in those aged 70-74 years.[22]

Based on data from the Third National Health and Nutrition Examination Survey, between 1988 and 1994 the prevalence of CAD in age-matched adult males and females in the US was 13.9% and 10.8%, respectively. Their findings (higher CAD in men) are contrary to ours; this is due to allowing for the definite history of disease, angioplasty, bypass surgery, and hospitalization due to MI, which led to higher CAD prevalence figures in men under study. Extensive primary prevention programs have decreased the prevalence of CAD in the US.[23]

A 1999 study in Iran using ECG and the Rose questionnaire reported the prevalence of CAD to be 19.4%,[10] which in light of our findings, is indicative of the growing trend of CAD in this country. Given the effectiveness of prevention in lowering the prevalence of CAD, appropriate primary preventive strategies should be deployed to encourage healthy lifestyle.

Community awareness of cardiac pain and its characteristics should also be raised and the importance of urgent medical care emphasized, alongside secondary prevention measures. This study was conducted as part of IHHP (sponsored by the Organization of Planning and Management and the deputy for Health of Iran Ministry of Health, Treatment and Medical Education.

## References

1. Antman EA, Braunwald E. ST-Elevation Myocardial Infarction: Pathology, Pathophysiology, and Clinical Features in Braunwald's Heart Disease. 7th edition. Elsevier Saunders Company 2005; 1141-68.
2. Gil Sri DJ, Bor Renhagen B. Risk evaluation in action for cardiovascular health. Crit Care Nurse 2005; 25(1): 26-37.
3. Boutayeb A, Boutayeb S. The burden of non communicable disease in developing countries. Int J Equity Health 2005; 4(1): 2-10.
4. Arslanagic A, Gerc V. New approach in the diagnosis of acute coronary syndrome. Med Arch 2004; 58(2): 43-9.
5. Keys A, Taylor HL, Blackburn H, Brozek J. Coronary heart disease among Minnesota business and professional men followed 15 years. Circulation 1993; 28: 381-95.
6. Shaw M, Maxwell R, Rees K, Oliver S. Gender and age in equity in the prevision of coronary revscularization in England in the 1990s: is it getting better? Soc Sci Med 2004; 59(12): 2499-507.
7. Singh R, Sharma J, Rastogi V. Prevalence of coronary artery disease and coronary risk factors in rural and urban populations of north India. Eur Heart J 1997; 18: 1728-35.
8. Rose GA. The diagnosis of ischemic heart pain and intermittent claudication in field surveys. Bull WHO 1962; 27: 645-58.
9. Sarraf-Zadegan N, Sayed-Tabatabaei FA, Bashardoost N, Maleki A, Totonchi M, Habibi HR, Sotodehmaram E, Tafazoli F, Karimi A. The prevalence of coronary artery disease in an urban population in Isfahan, Iran. Acta Cardiol 1999; 5: 257-63.
10. Sarraf-Zadegan N, Boshtam M, Malek-Afzali H, Bashardoost N, Tabatabaei FA, Rafiei M, et al. Secular trends in cardiovascular mortality in Iran. With special reference to Isfahan. Acta Cardiol 1999; 59(6): 327-33.
11. Iranian Ministry of Health, Treatment and Medical Education, Vice-Chancellery for Health. Simay-e-Salamat. 2002; Vol. 1: p 30-32.
12. Sarraf-Zadegan N, Sadry Gh, Malek-Afzali H, Baghai M, Mohammadifard N, Shahrokhy Sh, et al. Isfahan Healthy Heart Program: A comprehensive integrated community-based program for cardiovascular disease prevention and control. Acta Cardiol 2003; 58(4): 309-20.
13. Chen CH, Chuang JH, Kuo HS. Prevalence of coronary heart disease in Kin-chen, Kinmen. Int J Cardiol 1996; 55: 87-95.
14. Gupta R, Prakash H, Gupta VP. Prevalence and determinants of coronary heart disease in a rural population of India. Clin Epidemiol 1997; 50: 203-9.
15. Lee TH, Goldman L. Evaluation of the patient with acute chest pain. N Engl J Med 2000; 342: 1187-93.
16. Sigurdsson E, Sigfusson N, Sigvaldason H. Silent ST-T changes in an epidemiologic cohort study-a marker of hypertension or coronary heart disease or both: the Reykjavik study. J Am Coll Cardiol 1996; 27: 1140-7.
17. Cosin J, Asin E, Marrugat J, Elosua R, Aros F, de los Reyes M, Castro-Beiras A, Cabades A, Diago JL, Lopez-Bescos L, Vila J. Prevalence of angina pectoris in Spain. PANES Study group. Eur J Epidemiol 1999 Apr; 15(4): 323-30.
18. Smith WC, Kenicer MB, Tunstall-Pedoe H, Clark EC, Crombie IK. Prevalence of coronary heart disease in Scotland: Scottish Heart Health Study. Br Heart J 1990; 64(5): 295-8.
19. Ahto M, Isoaho R, Puolijoki H, Laippala P, Romo M, Kivela SL. Prevalence of coronary heart disease, associated manifestations and electrocardiographic findings in elderly Finns. Ageing 1998 Nov; 27(6): 729-37.
20. Chen CH, Chnang JH, Kuo HS, Chang MS, Wang SP, Chou P. Prevalence of coronary heart disease in Kin-Chen, Kinmen. Int J Cardiol 1996; 55(1): 87-95.
21. Shaper AG, Cook DG, Walker M, Macfarlane PW. Prevalence of ischaemic heart disease in middle aged British men. Br Heart J 1994Jun; 51(6): 595-605.
22. Sigurdsson E, Thorgeirsson G, Sigvaldason H, Sigfusson N. Prevalence of coronary heart disease in Icelandic men 1968-1986. The Reykjavik Study. Eur Heart J 1993; 14(5): 584-91.
23. Ford ES, Giles WH, Croft JB. Prevalence of nonfatal coronary heart disease among American adults. Am Heart J 2000; 139(3): 371-7.