

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

M Sadeghi MD<sup>(1)</sup>, H Ruhafza MD<sup>(2)</sup>, Sh Shirani MD<sup>(3)</sup>  
A Akhavan Tabib MD<sup>(4)</sup>, P Aghdak MD<sup>(5)</sup>, Sh Hosseini<sup>(6)</sup>

## Abstract

**INTRODUCTION:** Cardiovascular disease, coronary artery disease (CAD) in particular, is 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 evaluated in this cross-sectional study. Multi-stage cluster sampling was conducted in the provincial cities of Isfahan, Najaf-Abad and Arak. A questionnaire was used to collect demographic and job data. The Rose chest pain questionnaire with five questions was filled out by trained physicians. ECG and Minnesota coding were performed. Data were 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.

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

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

## Introduction

Cardiovascular disease (CVD) is the most common cause of mortality and morbidity in the West, accounting for more than 50% of all deaths.<sup>1</sup>

Every year, nearly 1.5 million people in the US are affected or debilitated by myocardial infarction (MI).<sup>2</sup> A similar status in terms of mortality and morbidity exists in many developing nations, which account for 80% of CVD-related mortality worldwide.<sup>3</sup>

The use of costly and time-consuming diagnostics such as exercise test and angiography are not advisable for epidemiological studies on CVD patients;<sup>4</sup> simpler and less expensive methods have been developed for epidemiological studies on patients with coronary artery disease (CAD). Minnesota EKG coding is a widely used method to study CVD.<sup>5</sup> 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.<sup>6,7</sup>

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.<sup>8</sup> A 1999 study using both methods in the urban areas of Isfahan, Central Iran, estimated the prevalence of CAD at 19.4%.<sup>9</sup> Studies in Iran have documented the growing trend of CAD-related mortality in this country.<sup>10</sup>

Between 2001 and 2003, CAD mortality in Isfahan Province rose from 121.5 to 156.6 per 100,000 population.<sup>11</sup> 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 (ICRC), PO. Box: 8146-1148. Isfahan, Iran. Email: m\_sadeghi@crc.mui.ac.ir

(2) Hamidreza Ruhafza MD. Psychologist, Head of Mental Health Research Unit, Isfahan Cardiovascular Research Center (ICRC)

(3) Shahin Shirani MD. Assistant Professor, Cardiologist, Isfahan Cardiovascular Research Center (ICRC)

(4) Afshan Akhavan Tabib MD. Research Assistant, Isfahan Cardiovascular Research Center (ICRC)

(5) Pezhman Aghdak MD. Research Assistant, Isfahan Province Health Center

(6) Shidokht Hosseini B.Sc. Research Assistant, Isfahan Cardiovascular Research Center (ICRC)

*Corresponding author:* Masoumeh Sadeghi

*Date of submission:* December 25, 2005

*Date of acceptance:* February 22, 2006

Minnesota EKG coding and the Rose questionnaire, as part of Isfahan Healthy Heart Program (IHHP), a community-based interventional program for non-communicable diseases (NCD) prevention and health promotion. The findings of this study can be used in the development of health policies in Iran.<sup>12</sup>

### 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 Iranian cities of Isfahan, Najafabad, and Arak.

Multistage cluster sampling method was used to enable classification according to sex ratio and place of residence.

Inclusion criteria were age above 35 years, no hemorrhagic disease or mental retardation, Iranian nationality, and having lived in the above cities for at least 10 years.<sup>12</sup> 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 cooperating with the study.<sup>8</sup>

The questionnaire contained 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
- Have you experienced resting pain, or pain lasting more than half an hour in anterior chest?

Respondents characterizing their angina with the first four questions, i.e. exertion-induced pain behind the sternum with relief occurring within 10 minutes of stopping exertion, and no accompanying symptoms were assigned to 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 no other characteristics of typical angina, as cases of possible angina.

The prevalence of CAD as determined by the Rose questionnaire is based on responses to the above questions.

Twelve-lead EKG 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.<sup>8</sup>

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

anterior and inferior chest leads.

Possible MI is defined as QS pattern in V<sub>1</sub>, V<sub>2</sub> and V<sub>3</sub> leads (in the absence of left bundle branch block),  $\frac{1}{5} < \frac{Q}{R} < \frac{1}{3}$  in anterior leads and Q-wave  $\geq 0.02$  in the

inferior leads. Definite cardiac ischemia was defined as flattened or depressed ST segment  $\geq 2$  mm in the anterior and/or inferior leads; possible ischemia was defined as depressed or flattened ST segment  $< 1$  mm and  $\geq 0.5$  mm in the anterior and/or inferior leads.<sup>5</sup>

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 to compare the prevalence of CAD in males and females and in 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  $50.81 \pm 11.09$  years, and 3160 men (48.6%) with a mean age of  $51.62 \pm 11.69$  years in three provincial Iranian 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 EKG according to sex

Age group (years)	Men		Women		Total	
	Number (percentage)	Number (percentage)	Number (percentage)	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)	33.38 (51.4)	64.98 (100)			

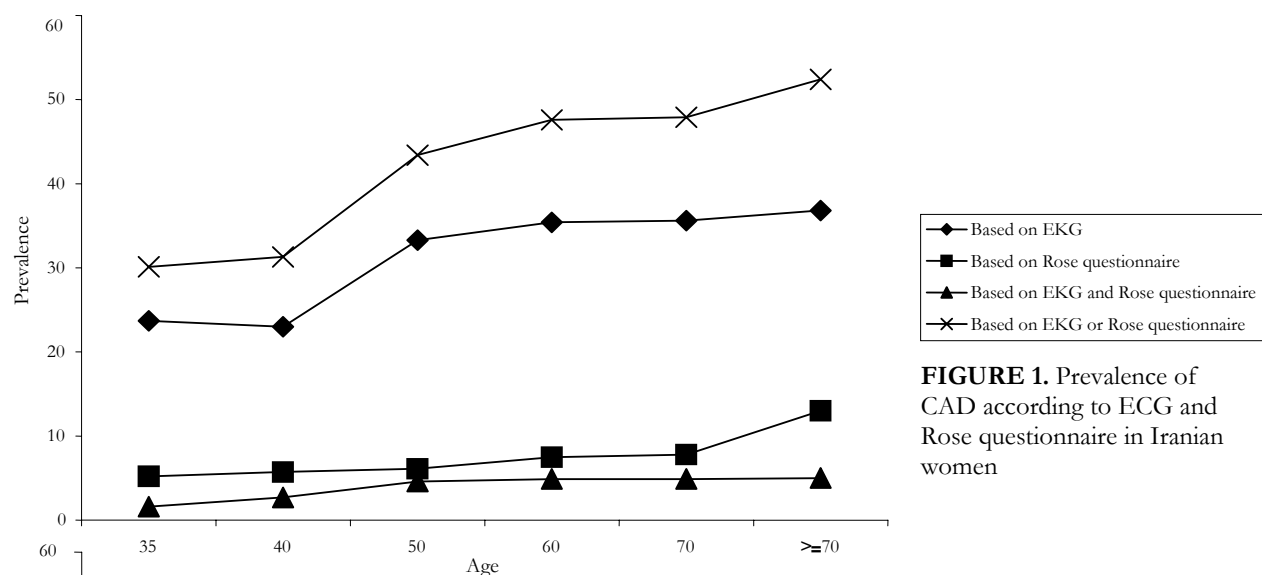
Table 1 shows the frequency distribution of subjects according to age and sex. Figure 1 shows the collective prevalence of CAD in men based on questionnaires and Minnesota EKG coding; the prevalence of CAD increased in a linear fashion with age and was higher as judged by EKG than derived from questionnaires.

Figure 2 shows the prevalence of CAD in women according to questionnaires and EKG; the prevalence of CAD increased with age and was higher as judged by EKG 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

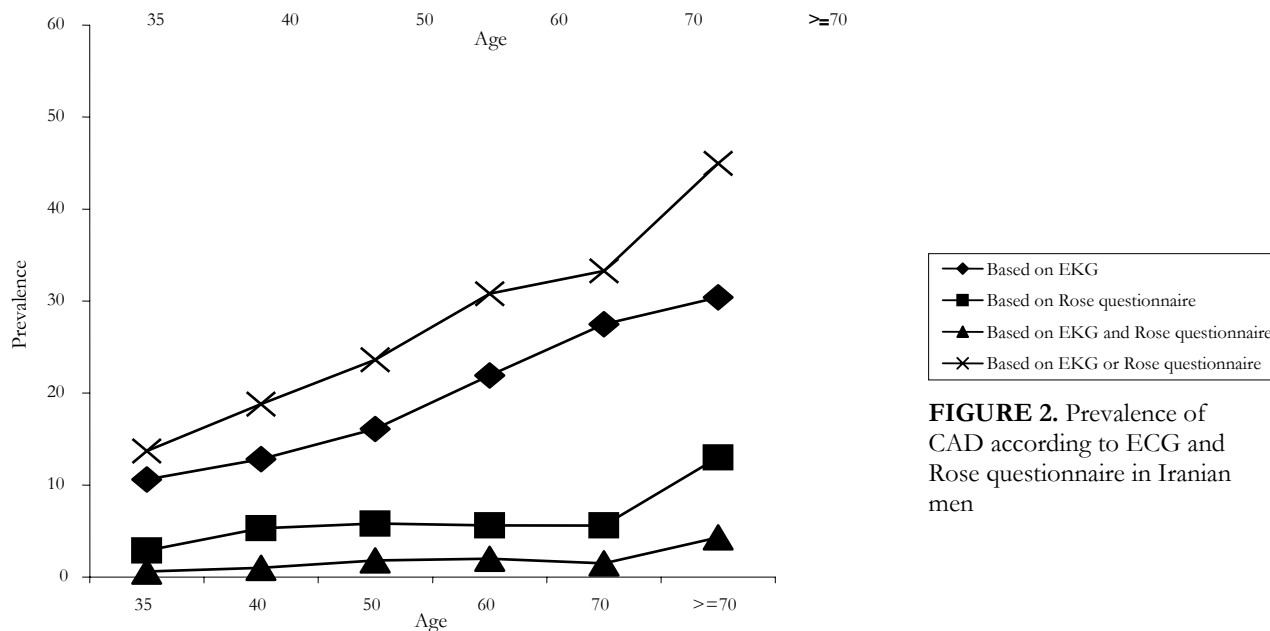
possible and definite ischemia decided based on EKG was higher in women than men in all ages. Possible and definite MI, however, was more prevalent in men ( $P<0.05$ ).

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

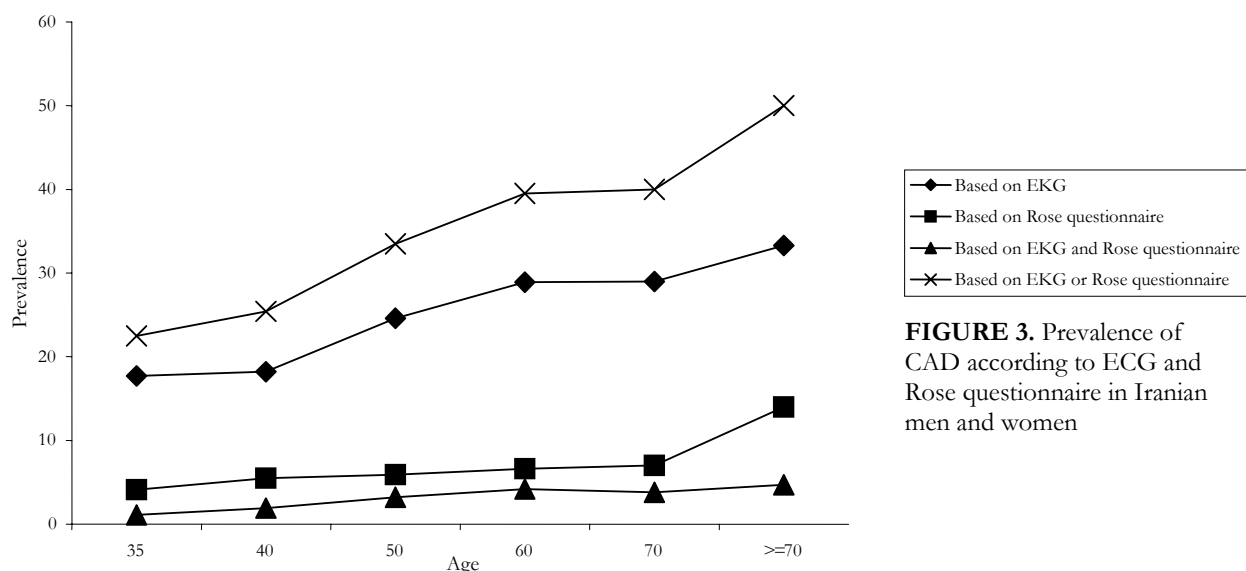
Table 2 shows the overall prevalence of CAD in men and women based on EKG and Rose questionnaire. CAD was found in both methods to be more prevalent in women than men. In both sexes, the prevalence of CAD determined by EKG was higher than that based on questionnaires ( $P<0.05$ ).



**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 EKG was 37.5% in women, and 22.2% in men. Comparative study of the prevalence of CAD according to the Rose questionnaire and EKG (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.<sup>13-15</sup>

On the other hand, the higher prevalence of CAD based on EKG, especially at higher ages, is demonstrative of asymptomatic EKG changes which may be a sign of silent ischemia.<sup>16</sup> A community-based study of 10,000 people in Spain 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.<sup>17</sup>

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.<sup>18</sup>

A community-based study of individuals older than 64 years 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 EKG changes at 33.9% and 39.3% in men and women, respectively. Of course the high prevalence rates were due to the subjects' old age.<sup>19</sup>

Based on the two methods in discussion, the prevalence of ischemic heart disease in Taiwan and India were reported at 21.4% in women and 11.6% in men.<sup>20</sup> Despite being consistent with our results, the latter study shows the prevalence of ischemic heart disease in Southeast and South Asia to be lower than in the West and our study population.

Shire designed an extensive study in the UK to assess the prevalence of CAD based on EKG and the Rose questionnaire in men aged 40-59. He reported EKG changes in 15% and chest pain (possible and definite angina) in 14% of the subjects, suggesting the presence of CAD. The low prevalence figures in the latter study can be explained by the exclusion of elderly subjects.<sup>21</sup>

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

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) contradict ours, as they accounted the definite history of disease, angioplasty, bypass surgery, and hospitalization due to MI, which led to higher CAD prevalence figures in men. Extensive primary prevention programs have decreased the prevalence of CAD in the US.<sup>23</sup>

A 1999 study in Iran using EKG and the Rose questionnaire reported the prevalence of CAD to be 19.4%,<sup>10</sup> which in light of our findings, is indicative of a growing trend. Given the effectiveness of prevention efforts in decreasing CAD, appropriate primary prevention strategies should be deployed to encourage healthier lifestyles.

Community awareness of cardiac pain and its characteristics, and the importance of urgent medical care should be increased and appropriate secondary prevention measures should be adopted.

This study was conducted as part of Isfahan Healthy Heart Program (IHHP), which is 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. 7<sup>th</sup> 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 revascularization 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* 1994 Jun; 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.