

Cardiovascular Disease Risk Factors in Patients with Confirmed Cardiovascular Disease

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Abstract

Background- We aimed to assess the magnitude of the problem of cardiovascular risk factors in hospitalized patients and to establish cardiovascular disease (CVD) risk factor profiles.

Methods- We selected 476 confirmed CVD patients by a multi-stage stratified cluster random sampling technique in Tabriz Heart Center. After obtaining demographic information and performing physical examination, we measured biochemical parameters. Data were analyzed with SPSS 10.05, and $p < 0.05$ was considered significant.

Results- Obesity was the most common abnormality (93.5%), followed by diabetes mellitus (58.4%), low levels of high-density lipoprotein cholesterol (HDL-c) (45.4%), low physical activity (41.6%), high total cholesterol (TC) (40.1%), high triglycerides (TG) (37.2%), high low-density lipoprotein cholesterol (LDL-c) (30.7%), diastolic hypertension (28.4%), high systolic blood pressure (24.8%) and smoking (20%). Ninety-three percent, 43%, 16% and 5% of patients had one, two, three and four risk factors for CVD, respectively. The prevalence of lipid disorders in females was more than that in males, except for low HDL-c ($p < 0.05$). Among the lipid profiles, only TG had a relationship with age ($p < 0.05$). Obesity was accompanied by lipid profile abnormality, such that low serum levels of HDL-c and high levels of TG, TC and LDL-c were more common in obese patients ($p < 0.05$).

Conclusion- This study revealed a high prevalence of risk factors in the CVD patients; thus modification of lifestyles is urgently needed (*Iranian Heart Journal 2007; 8 (4): 47-52*).

Key words: HDL-c ■ LDL-c ■ TC ■ TG ■ age ■ gender ■ BMI ■ cardiovascular disease

The prevalence of cardiovascular disease (CVD) among the Iranian population is high. Significant numbers of Iranians have one or more major risk factors for CVD.¹ CVD is one of the major health and social problems; coronary artery disease, the most common form of CVD, is the leading cause of death in Iran today.² According to many studies involving thousands of patients, researchers have found certain factors that play an important role in one's chances of developing heart disease.³

Although there are many risk factors related to CVD in our population, we focused on hypertension, lipid abnormality, smoking, gender, lack of exercise and obesity. It seems that the prevalence of CVD risk factors in our population with regard to the high prevalence of CVD is high, so we aimed to assess the magnitude of the problem of cardiovascular risk factors in hospitalized patients. In order to establish a CVD risk factor profile, we undertook an epidemiologic survey on patients of Tabriz Heart Center (THC).

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Methods

The study population was composed of patients who were admitted with confirmed CVD in 2004. The criteria for confirmed CVD were based on physical examination and paraclinical findings (biochemical lab tests, ECG, echocardiography, angiography). A multi-staged stratified cluster random sampling technique was used to select 476 patients aged 13 to 91. The study consists of 476 patients with confirmed CVD [173 females (36.3%), 303 males (63.7%)]. Mean age was 59.6 ± 13.04 years. The risk factors of cardiovascular disease in our study were: high-density lipoprotein cholesterol (HDL-c) ≤ 35 mg/dl and low-density lipoprotein cholesterol (LDL-c) ≥ 140 mg/dl, triglyceridemia (TG) ≥ 180 mg/dl and total cholesterol (TC) ≥ 200 mg/dl. The other risk factors were body mass index (BMI) ≥ 29 , smoking, diabetes mellitus (DM), menopausal condition, hypertension and low physical activity.

Trained physicians examined all patients according to a standard protocol. Personal, demographic and lifestyle information were obtained using a standardized questionnaire. The most preferred method was the BMI or Quetelet Index ($BMI = w/h^2$ in which w is body weight in kilograms and h is height in meters). Overweight and obesity were defined in terms of BMI based on NIH (National Institutes of Health) definition. Blood pressure was measured twice. There was at least a 15 min interval between two separate measurements, and the mean of the two measurements was taken as the blood pressure. In order to define criteria for hypertension and staging of blood pressure levels, we used JNC-VII criteria. According to the JNC-VII criteria, hypertension or high blood pressure in CVD patients is defined as mean systolic blood pressure (SBP) 130 mm Hg and mean diastolic blood pressure (DBP) 80 mm Hg.

Blood samples were drawn between 7:00 and 9:00 a.m. into vacutaner tubes from all study

participants after 12-14 hr of overnight fasting and centrifuged within 30-45 min of collection. All blood lipid analyses were made at the biochemical research laboratory on the day of blood collection using a Selectra 2 auto-analyzer (Vital Scientific, Spankeren, Netherlands) and TC and TG kits (Pars Azmon, Inc., Iran). TC and TG were assayed using enzymatic colorimetric tests with cholesterol esterase and cholesterol oxidase and glycerol phosphate oxidase, respectively. HDL-c was measured after the precipitation of the apolipoprotein B₁₀₀ containing lipoproteins with phosphotungstic acid. Assay performance was monitored at 20 test intervals using lipid control serum (Boehringer Mannheim, Germany; cat. no. 1446070 for Precinorm and 171778 for Precipath). Lipid standard (C.f.a.s., Boehringer Mannheim, Germany; cat. no. 759350) was used to calibrate the Selectra 2 auto-analyzer daily. Inter- and intra-assay coefficients of variation were 3.1 and 2.5% for HDL-c, 2 and 0.5% for TC, and 1.6 and 0.6% for TG, respectively. LDL-c was calculated in serum sample with TG levels (Friedwald's formula):

$$LDL-c = TC - (HDL-c + TG/5) \text{ if } TG \leq 400 \text{ mg/dl}$$

Fasting blood glucose was measured using an enzymatic colorimetric method and glucose oxidase technique.

The analysis was done with SPSS 10.05 software package (SPSS, Inc., Chicago, IL). The data are presented as frequencies, percentages, and 95% confidence intervals. Prevalence rates were standardized using Segi standard world population. The prevalence of different abnormalities was compared using χ^2 test. A P -value of <0.05 was considered statistically significant.

Results

Mean serum lipid profile (HDL-c, LDL-c, TG and TC) was 37.54 ± 0.80 mg/dl, 116.11 ± 4.11 mg/dl, 183 ± 11.36 mg/dl and 188 ± 4.50

mg/dl, respectively. Among patients with confirmed CVD, obesity was the most common abnormality (93.5%), followed by DM (58.4%), low HDL-c (45.4%), low physical activity (41.6%), high TC (40.1%), high TG (37.2%), high LDL-c (30.7%), diastolic hypertension (28.4%), high systolic blood pressure (24.8%) and smoking (20%). A main CVD risk factor in women was menopause (85%). Ninety-three percent of patients had just one, 43% two, 16% three and 5% had four risk factors for CVD (Table I).

Table I. Prevalence of CVD risk factors in patients

CVD risk	Male no.	Male %	Female no.	Female %	Total no.	Total %
Obesity	279	92.1	166	96	445	93.5
DM	172	56.8	106	61.3	278	58.4
HDL-c ≤ 35	151	49.1	65	37.6	216	45.4
Inactivity	118	38.9	80	46.2	198	41.6
TC ≥ 200	107	35.3	84	48.6	191	40.1
TG ≥ 180	106	35	71	41	177	37.2
LDL-c ≥ 140	79	26.1	67	38.7	146	30.7
D.HTN	86	28.4	49	28.3	135	28.4
S.HTN	58	19.1	60	34.7	118	24.8
Smoking	84	27.8	11	6.3	95	20

CVD: cardiovascular disease, DM: diabetes mellitus, HDL-c: high density lipoprotein cholesterol, TC: total cholesterol, TG: triglyceride, LDL-c: low density lipoprotein cholesterol, D.HTN: diastolic hypertension S.HTN: systolic hypertension

Mean levels of HDL-c in females were higher than those in males (38.62 ± 1.25 mg/dl vs. 36.92 ± 1.01 mg/dl; $P < 0.05$, $t = 2.004$). Mean levels of LDL-c and TC in females were higher than those in males (122.50 ± 7.58 , 200.31 ± 8.78 vs. 112.48 ± 4.78 , 181.72 ± 5.13 ; $p < 0.05$, $p < 0.005$; $t = 2.29$, $t = 3.83$, respectively) but no significant quantified relationship was found between gender and

TG ($p > 0.05$). The prevalence of lipid disorders in females was more common than that in males, except for low levels of HDL-c ($p < 0.05$, Fig 1).

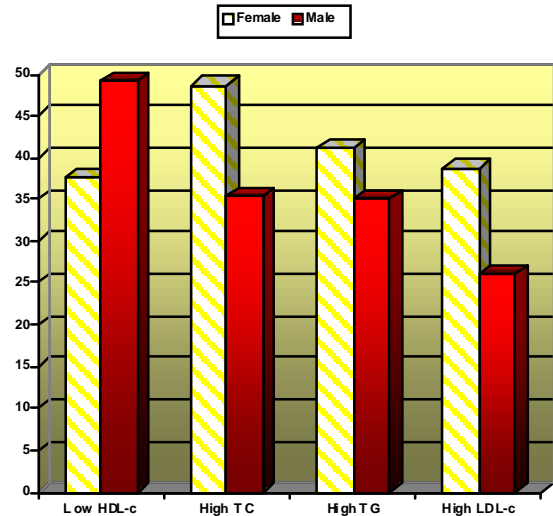


Fig. 1. Relationship between gender and dyslipidemia

BMI in males was higher than that in females ($p < 0.05$). A marked relationship was noticed between gender and high SBP ($p < 0.005$), but there was no link between gender and DM, low physical activity and diastolic hypertension (Fig. 2).

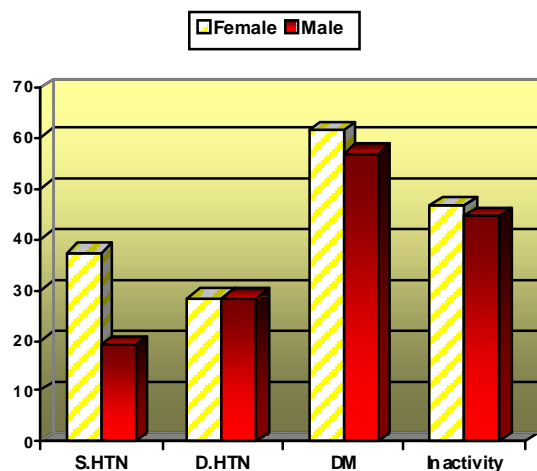


Fig. 2. The relationship between hypertension, DM, inactivity and gender

Smoking was more common in males ($p < 0.005$).

Among lipid profiles, only TG had a relationship with age ($p < 0.05$). Increasing age was accompanied by high serum level of TG ($r = 0.14$, $p < 0.005$). Also, the elderly patients had more systolic hypertension, high BMI and more prevalence of DM ($t = 1.99$, $p < 0.05$; $r = 0.17$, $p < 0.005$; $t = 1.14$, $p < 0.005$, respectively). Smoking led to systolic and diastolic hypertension in all patients, but there was no relationship among other risk factors of CVD with smoking ($p > 0.05$). It was noted that obesity was accompanied by lipid profile abnormality, such that low serum levels of HDL-c and high levels of TG, TC and LDL-c were more common in obese patients ($p < 0.05$).

Discussion

This study found that significant numbers of patients had different risk factors for CVD. Overall, 93.5% were obese and 58.4 percent were diabetic. 45.4% had low HDL-c, 41.6% low physical activity, 40.1% high TC, 37.2% high TG and 30.7% high LDL-c. Isolated diastolic and systolic hypertension was found in 28.4% and 24.8% of patients, respectively. Twenty-seven percent of patients were smokers. In addition, many patients had at least one of the CVD risk factors (93%). In the Bovet Study, the prevalence of main risk factors was: 39.6% for high blood pressure; 24.2% for high TC; 20.8% for low HDL-c; 9.3% for DM; 17.5% for smoking; 25.1% for obesity and 22.1% for the metabolic syndrome.⁴ In another study on 1685 individuals, 27% smoked, 47.8% had high blood pressure, 24.2% had hypercholesterolemia, 11.7% had DM, 27% were obese and 40.1% were overweight.⁵ The results of this study revealed high prevalence of CVD risk factors in patients with confirmed CVD. The high prevalence of HTN, excess weight, obesity, serum lipid disorders, DM and cigarette smoking was indicative of the importance and significance of urgent attention to these risk factors. Most researchers agree that obesity is an important

modulator of heart disease⁶ and suggested that overweight is the first behavioral risk factor.⁷ Obesity is currently considered an independent risk for coronary artery disease.⁸ A linear relationship was observed between BMI and some coronary risk factor scores in both men and women.⁹ In this study, most of our patients were obese and obesity was accompanied by lipid abnormality. BMI has a significant relationship with the conventional risk factors of coronary artery disease and a negative relationship with HDL-c.⁸ Increased serum TC, LDL-c and decreased HDL-c are well-established risk factors for ischemic heart disease in middle-aged populations.¹⁰ Our findings indicated that lipid abnormality was one of the major CVD risk factors in patients, especially in males, and that serum HDL-c level was lower in patients of comparable sex. Concomitant increasing serum TC, LDL-c and TG, however, were found in our population. Research showed that lipid abnormality was more common in women than that in men and that fewer women than men had low HDL-c; be that as it may, women were more likely than men to have high LDL-c levels.¹¹⁻¹³ The findings of this study indicated that the prevalence of lipid disorders in females was more than that of males, except for low HDL-c. The level of serum HDL-c decreases with increasing age, especially in the group of 75-79 year-old persons. LDL-c shows an increase with a maximum in the age group 60-70 years.¹⁴ However, in our study there was no significant relationship between age and lipid profile, except for TG. From among all of the risk factors for CVD, high blood pressure is the best predictor of coronary artery disease.^{15,16} In one study, the prevalence of hypertension was 26%.^{15,17} The study showed that our population had increased systolic and diastolic hypertension. A marked relationship was noticed between gender and high SBP and also the elderly patients had systolic hypertension. The epidemiologic studies that evaluated the CVD risk factors demonstrated that HTN was

28.9%, with no statistical difference between men (30%) and women (28.4%), but prevalence of hypertension increased with age.¹⁸

It is well established that smoking is a major risk factor for ischemic heart disease.¹⁹ According to this study, smoking led to DM, systolic and diastolic hypertension in all patients and smoking was reported in twenty percent of patients. It was significantly higher in men than in women. Similarly in another study, smoking was reported in 21.5 %.¹⁸

DM and obesity have reached epidemic proportions in many developing and developed nations, leading to talk of the “twin epidemics”. The lasting projections from the International Diabetes Federation suggest that 190 million people worldwide currently have diabetes.²⁰ In our study, DM was the second important risk factor of CVD and 58.4% of patients were diabetic. Appropriate therapy may be determined via screening of patients for levels of fasting blood sugar and lipids, as well as other CVD risk factors.

Conclusion

The results of this study revealed a high prevalence of cardiovascular risk factors in the confirmed CVD patients. The high prevalence of obesity, serum lipid disorders, low physical activity, hypertension, DM, and cigarette smoking are indicative of the importance and significance of urgent attention to these risk factors. The urgency and importance of interventional measures to modify lifestyles including alterations in diet, calories, lipid and cholesterol intake, increase in physical activity, cessation of cigarette smoking, and decrease in psychological stress are obvious. It seems that the Iranian population is moving towards obesity very fast and this problem, which originates in childhood, has serious negative outcomes. Considering the increase in mean age of the population and the alteration in the age pyramid in our society, the vitality of concentrating on the above-mentioned issues

as major national health problems and taking comprehensive interventional measures is strongly recommended.

It is hoped that the second stage of this study will provide health personnel and policy makers with valuable findings, instrumental in the beneficial modification of present lifestyles.

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