

Cardiovascular disease risk factors in patients with confirmed cardiovascular disease

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ABSTRACT

Objectives: To assess the magnitude of the problem of cardiovascular risk factors in hospitalized patients, and to establish cardiovascular disease (CVD) risk factor profiles.

Methods: The study included 476 confirmed CVD patients selected by a multi stage stratified cluster random sampling technique in Tabriz Heart Center (Shaheed Madani Hospital), Tabriz, Iran from February 2004 to May 2005. After obtaining demographic information and performing physical examination, biochemical parameters were measured. Data was analyzed using the Statistical Package for Social Science version 10.05, where p value of <0.05 was considered significant.

Results: Obesity was the most common abnormality (93.5%) followed by diabetes mellitus (58.4%), low high-density lipoprotein cholesterol (HDL-c) (45.4%), low physical activity (41.6%), high total cholesterol (40.1%),

high triglyceride (37.2%), high low-density lipoprotein cholesterol (30.7%), diastolic hypertension (28.4%), high systolic blood pressure (24.8%) and smoking (20%). Of the total number of patients, 93% had one risk factors for CVD, 43% had 2, 16% had 3, and 5% had 4 risk factors. The prevalence of lipid disorders in females was more than males except for low HDL-c ($p<0.05$). Between lipid profiles, only TG showed a correlation between age ($p<0.05$). It was noticed that obesity accompanied by lipid profile abnormalities as low serum levels of HDL-c and high level of TG, TC, and LDL-c were more seen in obese patients ($p<0.05$).

Conclusion: This study revealed a high prevalence of risk factors in CVD patients; thus, urgent lifestyle modification is recommended.

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The prevalence of cardiovascular disease (CVD) among Iran population is high. Significant numbers of Iranians have one or more major risk factors for CVD.¹ Cardiovascular disease 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 person'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 is high, so the present study aimed to assess the magnitude of the problem of cardiovascular risk factors in hospitalized patients, and establish a CVD risk factor profile. We undertook this study as an epidemiologic survey of patients admitted to a heart center in Iran.

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Methods. The study population included patients who were admitted with confirmed CVD in Tabriz Heart Center, Tabriz, Iran, from February 2004 to May 2005. The criteria for confirmed CVD were based on physical examination and paraclinic findings (biochemical lab tests, electrocardiogram, echocardiography, angiography). A multi stage stratified cluster random sampling technique was used to select 476 patients aged 13-91 years with confirmed CVD [173 (36.3%) females, 303 (63.7%) males]. Mean age was 59.6 ± 13.04 years. The risk factors of cardiovascular disease in our study were based on: high-density lipoprotein cholesterol (HDL-c) ≤ 35 mg/dl (normal range (NR): 36-80 mg/dl), and low-density lipoprotein cholesterol (LDL-c) ≥ 140 mg/dl (NR: <140 mg/dl), triglyceridemia (TG) ≥ 180 mg/dl (NR: ≥ 180 mg/dl) and total cholesterol (TC) ≥ 200 mg/dl (NR: ≥ 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 following a standard protocol examined all patients. Personal, demographic and lifestyle information were obtained using a standardized questionnaire. The most preferred method is the BMI or Quetelet Index ($BMI = W/H^2$ in which W is weight in kilograms and H is height in meters). Overweight and obesity were defined in terms of BMI based on National Institute of Health definition.⁴ Blood pressure was measured twice. There was at least 15 minutes interval between 2 separate measurements and the mean of the 2 measurements was taken as the blood pressure. In order to define the criteria for hypertension and staging of blood pressure levels, we used the JNC-VII criteria.⁵ According to the JNC-VII criteria, hypertension or high blood pressure in CVD patients is having a mean systolic blood pressure (SBP) of 130 mmHg, and a mean diastolic blood pressure (DBP) 80 mmHg.

Blood samples from all participants were drawn between 7:00 and 9:00 am into a vacutainers tube after 12-14 hours of overnight fasting. Then samples were centrifuged within 30-45 minutes of collection. All blood lipid analyses were made at a biochemical research laboratory on the day of blood collection using a Selectra 2 auto-analyzer (Vital Scientific, Spankeren, The Netherlands), and TC and TG kits (Pars Azmon, Inc., Iran). The TC and TG were assayed using enzymatic colorimetric tests with cholesterol esterase and cholesterol oxidase, and glycerol phosphate oxidase. The HDL-c was measured after 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. The 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 glucose oxidase technique.

The data analysis was carried out using the Statistical Package for Social Sciences version 10.05 software package (SPSS, Inc., Chicago, IL). The data were 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. The mean serum lipid profile was 37.54 ± 0.80 mg/dl for HDL-c, 116.11 ± 4.11 mg/dl for LDL-c, 183 ± 11.36 mg/dl for TG and 188 ± 4.50 mg/dl for TC. 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%). The main CVD risk factor in women was menopausal condition (85%). Ninety-three percent of patients had just one, 43% had 2, 16% had 3 and 5% had 4 risk factors for CVD (Table 1).

The mean levels of HDL-c in females were higher than males (38.62 ± 1.25 mg/dl versus 36.92 ± 1.01 mg/dl; $p < 0.05$, $t = 2.004$). Furthermore, the mean levels of LDL-c and TC in females were higher than males (122.50 ± 7.58 , 200.31 ± 8.78 versus 112.48 ± 4.78 , 181.72 ± 5.13 ; $p < 0.05$, $p < 0.005$; $t = 2.29$, $t = 3.83$), but there was no significantly quantified relationship between gender and TG ($p > 0.05$). The prevalence of lipid disorders in females was more than the males except for low HDL-c ($p < 0.05$) (Table 1). The BMI in males was higher than females ($p < 0.05$). A marked relationship was noticed between gender and high SBP ($p < 0.005$) but there was no correlation between gender and DM, low physical activity and diastolic hypertension (Table 1). Smoking was more common in males ($p < 0.005$).

Table 1 - The prevalence of CVD risk factors in patients

CVD risk	Male n (%)	Female n (%)	Total n (%)
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

Between lipid profiles, only TG had a correlation with age ($p < 0.05$). The increase in age was accompanied by high serum level of TG ($r = 0.14$, $p < 0.005$), also elderly patients had systolic hypertension, high BMI and more prevalence of DM ($t = 1.99$, $p < 0.05$; $r = 0.17$, $p < 0.005$; $t = 1.14$, $p < 0.005$). Smoking led to systolic and diastolic hypertension in all patients, however, our results showed no relationship among other risk factors of CVD with smoking ($p > 0.05$). It was noticed that obesity accompanied by lipid profile abnormalities as low serum levels of HDL-c and high level of TG, TC, and LDL-c were more seen in obese patients ($p < 0.05$).

Discussion. Our study showed that significant number of patients had different risk factors for CVD. Many participants had at least one of the CVD risk factors (93%). In Bovet et al⁶ study, the prevalences of the main risk factors were 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. In another study,⁷ which included 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.

The results of the present study revealed high prevalence of CVD risk factors in patients with confirmed CVD. The high prevalence of hypertension, overweight, obesity, serum lipid disorders, DM and cigarette smoking are indicative of the importance and significance of urgent attention to these risk

factors. Most researchers agree that obesity is an important modulator of heart disease,⁸ and suggested that overweight is the first behavioral risk factor.⁹ Obesity is currently considered an independent risk for coronary artery disease.⁶ A linear relationship was observed between BMI and the some of coronary risk factors scores in both men and women.¹⁰ In this study, most of our patients were obese and obesity was accompanied by lipid abnormality. The BMI has a significant relationship with the conversional risk factor of coronary artery disease, and a negative relationship with HDL-c.¹¹

Increased serum TC, LDL-c and decreased HDL-c are well-established risk factors for ischemic heart disease in middle age.¹² Our findings indicated that lipid abnormality was one of the major CVD risk factors in patients, especially in males and serum HDL-c level was lower in patients of comparable gender. Concomitant increase in serum TC, LDL-c and TG, however, were found in our population. Reports showed that the lipid abnormality in women was more common than men and fewer women than men had low HDL-c, however, women were more likely than men to have high LDL-c levels.¹³⁻¹⁵ The findings of this study indicated that the prevalence of lipid disorders in females was more than males except of low HDL-c. The level of serum HDL-c decreases independence on age, especially in the age group of 75-79 years old persons. The LDL-c shows an increase with a maximum in the age group of 60-70 years.¹⁶ But in our study, there was no significant relationship between age and lipid profile, except for TG.

From all of the risk factors for CVD, high blood pressure is the best predictor of coronary artery disease.^{17,18} Previous studies showed that the prevalence of hypertension was 26%.^{17,19} This study showed that our population has systolic and diastolic hypertension. A marked relationship was noticed between gender and high SBP, and also with elderly patients with systolic hypertension. The epidemiologic studies that evaluate the CVD risk factors demonstrated that HTN was 28.9% with no statistical difference between men (30%) and women (28.4%), however, the prevalence of hypertension increased with age.²⁰ It is well established that smoking is a major risk factor for ischemic heart disease.²¹ According to this study, smoking led to DM, systolic and diastolic hypertension in all patients and smoking was reported in 20% of patients. It was significantly high in men than women. Similarly, in other study smoking was reported in 21.5 %.²⁰

Diabetes mellitus and obesity have reached epidemic proportions in many developing and

developed nations, also called “twin epidemics”. The lasting projections from the International Diabetes Federation suggest that 190 million people worldwide currently have diabetes.²² In our study, DM was the second most important risk factor of CVD, wherein 58.4% of patients were diabetics. Appropriate therapy may be determined via screening of patients for levels of fasting blood sugar and lipids, as well as other CVD risk factors.

The results of this study revealed a high prevalence of cardiovascular risk factors in 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 Iranian 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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