

# Cardiovascular risk factors in people abovetwenty years old in Gonabad, Iran

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## Abstract

Cardiovascular diseases are considered as important causes of morbidity and mortality and constitute a major public health concern both in Iran and worldwide. Due to the increase in cardiovascular diseases, the present study was carried out to determine the prevalence of cardiovascular risk factors among Gonabad urban population. This cross-sectional study was performed in May-April, 2009 on a total of 606 subjects (205 males and 401 females) recruited through random cluster sampling. Biochemical tests were performed to measure blood glucose, total cholesterol, triglyceride, LDL-C and HDL-C, and anthropometric and blood pressure measurements were also performed. Data were analyzed through statistical tests. The average age of the participants was  $39.41 \pm 12.56$  and the most prevalent cardiovascular risk factors were high LDL-C ( $\geq 130$  mg/dl) and total cholesterol ( $\geq 200$  mg/dl). The next prevalent factors included high blood pressure most common among women (33.1%), obesity (22.4%), and abdominal obesity (17.8%). According to findings, high blood pressure was more prevalent in females (33.1) than males (30.6). HDL-C prevalence rate was higher among females, while high blood pressure and WHR were significantly more prevalent among males. Regarding the exceedingly high prevalence rate of some risk factors including LDL-C and total cholesterol in Gonabad, the need for a preventive intervention program to control risk factors and cardiovascular diseases is deemed important.

**Keywords:** Cardiovascular, Diseases, Risk factors

## Introduction

Cardiovascular diseases are the main cause of mortality and disability in the developed and less-developed countries including Iran [1,5]. These diseases are known as one of the health threatening factors in the world with high treatment costs [6,7]. They annually comprise 34% of mortality in the world [8]. The number of people susceptible to these diseases is increasing, and based on the report of World Health Organization (WHO); it will reach 11.1 million people in 2020 [9,10].

Epidemiological and clinical studies show that many factors cause cardiovascular diseases, some of which are treatable such as hypertension, dyslipidemia, immobility,

smoking and diabetes [1,2,4,11,13] and in some reports, factors such as unhealthy nutrition, sedentary lifestyle and smoking account for causes of 75% of cardiac disorders [8].

The prevalence of risk factors varies with factors such as age, gender and geographical region. Age, gender and family history are the factors which cannot be modified [1,8]. New studies show that prevalence rate of these diseases can be reduced by controlling risk factors [5]. Different studies in different regions of Iran indicate high level of some risk factors. In a study on a Lor nomads in south of Iran, 37.4% had with hypertension

and 57.1% of the population were at average to high risk of cardiovascular diseases [14]. In another study in Tabriz Heart Hospital, obesity (93.5%) was determined as the most prevalent risk factor for cardiac disorders, then diabetes (58.4%) and low HDL-C (45.4%), high total cholesterol (40%), high triglyceride (37.2%), high LDL-C (30.7%), diastolic and systolic hypertension (28.4% and 24.8%) and smoking (20%) [15]. Another study in seven Latin American countries showed the following prevalence; 18% hypertension, 7% diabetes, 23% obesity and 30% smoking [16]. Another study in Nepal showed 34% of the population had hypertension, 32% were obese and 22.5% with metabolic syndrome [17]. Other studies in Switzerland reported prevalence rate of obesity as 15.7%, smoking as 27%, hypertension as 36.7%, and diabetes as 6.6% [18]. Another report from China shows that prevalence rates of diabetes, hypertension, dyslipidemia and obesity were 10.7, 39.5, 56.7 and 13.6% respectively [19]. Cardiovascular disorders are mainly related to atherosclerosis, and dyslipidemia is one of the most important factors causing it [20]. Consumption of Omega 3 fatty acids can prevent this complication by improving lipid profile particularly HDL-C and LDL-C [21,22]. Hypertension is also one of the important risk factors of cardiovascular diseases and is very prevalent in industrial countries [23,24]. It is estimated that its prevalence rate will increase from 1 billion people in early twenty first century to 1.5 billion people in 2025 and controlling hypertension is regarded as one of the necessary factors in reduction of cardiac diseases [25]. Obesity and being overweight are also accompanied by increased morbidity and mortality caused by cardiac disorders, and atherosclerosis lesions are frequently observed in obese people [26,28]. Considering the importance of controlling risk factors in prevention of cardiovascular diseases, and rapid increase of risk factors in recent years [8] and lack of study in Gonabad, the present study was conducted to identify factors and

high risk people, and to present preventive plans.

### Method

In this descriptive-analytical study, 22 clusters among 8000 households present in city of Gonabad were randomly selected from 22 districts of the city based on divisions of Gonabad University of Medical Sciences health deputy and according to the list of households available to them. Then 30 households in each cluster and one person in each household were selected by simple random sampling method.

According to preliminary sampling, 606 people (401 women and 205 men) with the age range of 20-84 years were selected at confidence level of 95% and with accuracy of 0.05 and statistical power of 80% ( $1 - \beta$ ) and by considering design effect = 2. Venous blood sample (14-hour fasting) was taken for laboratory tests after obtaining informed consent and completing sampling checklist. Total cholesterol, triglyceride, LDL-C and fasting blood sugar, were measured using enzyme method and commercial kits (Pars Azmoon Company). Blood pressure was measured from the right hand in sitting position and after 5-minute rest with a standard mercury sphygmomanometer. Weight, height, waist circumference and hip circumference were measured in standing position and with a thin dress.

After calculating waist-hip ratio and Body Mass Index, data were analyzed using SPSS software version 13 and by Chi square statistical tests to find whether there is a correlation between gender and the risk factors, and independent t-test was performed to study if there is a difference between mean risk factors of cardiovascular diseases based on gender.  $P < 0.05$  was considered significant.

### Results

Mean age of the study population was  $39.41 \pm 12.56$  years. The most prevalent risk factor in both genders was LDL-C disorder ( $\geq 130$  mg/dl) followed by total cholesterol disorder ( $\geq 200$  mg/dl) (Table 1). There was no

significant difference between these two factors and gender. HDL-C disorders (P=0.004) and smoking (P=0.001) were significantly higher in men than in women and obesity (P=0.03) was significantly higher in women than in men. LDL-C disorders, hypertension, fasting blood sugar and BMI and WHR were more prevalent in women but no significant difference was found between women and men. Triglyceride and total cholesterol disorders were more prevalent in men but a significant difference was not found between the two genders. Comparing mean values of risk factors for cardiovascular diseases based on gender showed that values of total cholesterol, triglyceride, LDL-C and FBS were higher in men than in women but statistical tests did not show a significant difference (Table 2).

HDL-C rate in men was significantly lower than that in women (P=0.004). In addition, comparison of values of systolic and diastolic blood pressure (P=0.001) and WHR (P=0.001) showed significant differences between two genders and they were higher in men than in women. Other findings of this study showed that BMI in men was lower than that in women but no significant difference was found between two genders. Other results of this study showed that 86.2% of the study population showed at least one factor out of five risk factors (HDL-C, LDL-C, TC, TG disorders and blood pressure).

In the present study, ratio of HDL-C to LDL-C was calculated 3.4 which is an important risk factor in emergence of cardiac diseases.

**Table 1** Frequency of Risk Factors Based On Gender

	Female N(%)	Male N(%)	Total N(%)	P-value
TG $\geq$ 200	60(15)	32(15.6)	92(15.2)	0.19
LDL - c $\geq$ 130	203(50.6)	98(47.6)	301(49.6)	0.89
TC $\geq$ 200	180(44.9)	97(47.1)	277(45.6)	0.9
HDL - c $<$ 35	46(11.6)	36(17.5)	82(13.5)	0.004
FBS $\geq$ 126	35(9.6)	15(7.9)	50(8.3)	0.4
BMI $\geq$ 30	100(25.1)	36(17.5)	136(22.4)	0.03
WHR $\geq$ 0.85 woman WHR $\geq$ 0.95 man	63(15.7)	45(21.8)	108(17.8)	0.07
BP $\geq$ $\frac{140}{90}$	138(34.4)	63(30.6)	201(33.1)	0.19
Smoking	5(1.25)	35(17)	40(9.8)	0.001

**Table 2** Mean values of risk factors of cardiac diseases based on gender

	Woman Mean $\pm$ SD	Man Mean $\pm$ SD	Total Mean $\pm$ SD	P-Value
Total cholesterol	199.99 $\pm$ 41.32	200.16 $\pm$ 41.04	200.13 $\pm$ 41.20	0.9
Triglyceride	130.22 $\pm$ 85.53	78.16 $\pm$ 139.52	83.15 $\pm$ 133.38	0.19
HDL-C	$\pm$ 6.96 40.95	$\pm$ 6.72 39.26	6.92 $\pm$ 40.37	0.004
LDL-C	132.91 $\pm$ 36.12	133.32 $\pm$ 38.65	36.97 133.05 $\pm$	0.19
FBS	85.74 $\pm$ 23.02	35.15 $\pm$ 89.15	27.286.77 $\pm$	0.4
Systolic blood pressure	20.24113.99 $\pm$	15.31 $\pm$ 125.76	19.51 $\pm$ 118	0.001
Diastolic blood pressure	70.55 $\pm$ 15.13	14.62 $\pm$ 76.59	15.22 $\pm$ 72.61	0.001
BMI	26.76 $\pm$ 4.80	4.02 $\pm$ 26.40	26.64 $\pm$ 4.55	0.35
WHR	0.06 $\pm$ 0.78	0.91 $\pm$ 0.057	0.82 $\pm$ 0.085	0.001

Values of triglyceride (TG) , total cholesterol, LDL-C, HDL-C and FBS are in terms of  $\frac{mg}{dl}$ , pressure is in terms of mmHg and BMI is in terms of  $\frac{kg}{m^2}$  Values of P below 0.05 were considered significant.

### Discussion

The results of this study showed that dyslipidemia (increase in values of LDL-C and total cholesterol) was the most prevalent among risk factors so that 49.6% of the people showed disorder of LDL-C and 45.6% showed increase of total cholesterol. The second risk factor after dyslipidemia was hypertension which was observed with prevalence of 33.1%. High values of LDL-C with frequency of 49.6% (women, 50.6% and men, 47.6%) were the more prevalent. In a study in Tehran, 47.5% of the studied people had high values of LDL-C which was in line with findings of this study [28].

Comparing values of LDL-C with other countries indicate higher prevalence of this risk factor. Studies conducted in Indian population have reported prevalence rate of LDL-C as 32.29 % (men, 31.14% and women, 34.7%)[29]. In the present study, high values of total cholesterol with prevalence rate of 45.6% (women, 44.9% and men, 47.1%) was the second prevalent risk factor. In the study conducted in Tehran, respectively 57.3% and 60% of the men and women had high cholesterol which was more prevalent than those in the present study [28].

Other studies conducted in Iran and other countries indicate lower prevalence of this disorder. A study which was conducted in Yazd reported prevalence of this disorder as 21.1% (men, 10.6%, and women 13.8%) which was considerably lower than that in the present study [5]. Another study which was conducted in India reported high values of cholesterol as 31.67% (men, 29.38 and women, 33.98%)[29] which was less prevalent than that in the present study. Other studies conducted in Nepal and South Carolina showed 12.6% and 39% of the studied people had hypercholesterolemia which was significantly lower than that in the present study [31,32]. It seems that improper diet and sedentary lifestyle were the major causes of hypercholesterolemia in the present study.

Hypertension, a global health problem with high prevalence in industrial and developed countries, is regarded as one of the significant causing agents for cardiovascular diseases [22,23]. Studies show that blood pressure control is necessary for reducing cardiovascular disorders [33,35] and this factor causes 20 to 50% of mortality in cardiovascular disorders [36].

Comparing rates of this disorder in different regions of Iran such as workers in Isfahan (16%) and Yazd (25.6%) indicated high prevalence of this risk factor in the studied region [36,5]. In addition, comparison of values of this factor with other regions in the world indicated that it was lower than that of some countries such as Nigeria (46.4%) and some regions of the U.S. (66%) and it was higher than that of African Sahara (22%), India (25.7%) and Ghana (28.7%)[3,23,29, 33,37].

Considering increase in prevalence rate of this risk factor in recent years, it seems that high value of this risk factor in the present study is due to high prevalence of obesity and hyperlipidemia. Genetic factors are predispose people to hypertension and the use of low fat and vegetarian diet can reduce blood pressure [23,38]. It is necessary to note that hypertension is a treatable disease and regular screening plans are necessary for identifying and treating it in primary stages [22].

Another finding of this study showed a significant increase (P=0.001) of this factor in men than that in women which is in line with studies conducted in African Sahara and Jizan of Saudi Arabia[22,37].

Another studied factor was BMI which was measured 25.1% and 17.5% respectively in women and men with total mean of 22.4% obesity. It seems that higher prevalence of obesity in women is related to lower physical activity and difference in food habits.

New studies show that risk of cardiovascular diseases increases with obesity particularly visceral obesity [27] and prevalence of this disorder is increasing in many regions of the world particularly in young population [1]. Visceral obesity was observed in 17.8% of the studied people.

Comparison of obesity rates in recent study with some countries such as South India (26.5%), Nigeria (30%)

and Tamilnadu (26.1%) indicated its increase and comparison of obesity rates in recent study with some other countries such as Africa (18%) and North Nigeria (21%) indicated its decrease [3,29,37,38,39]. Studies conducted among drivers of Kashan city reported prevalence rate of this disorder as 23% which was in line, to some extent, with results of the present study [40]. In the present study, visceral obesity was observed in 17.8% of people which was lower than that in some countries such as Nigeria (31%) and South India (32%) [3,29]. It seems that the presence of different food habits is one of the causes of these differences. Generally, obesity is one of the disorders increasing in developed countries. New studies show that 75% of cardiac disorders occur due to improper diet and sedentary lifestyle, so low calorie diets and physical activities are recommended for preventing it [41]. Tendency to consume carbohydrate and fat rich food is the major cause of obesity and hypercholesterolemia. In recent years, expanding consumption of fast foods in some regions in the world is regarded as a cause of obesity and this disorder increases dyslipidemia and hypertension [40]. Increase in blood sugar and uric acid are other complications of this risk factor [41].

Other results of this study showed that 13.5% of the people in the study population had HDL-C of less than  $35 \frac{mg}{dl}$  and comparing prevalence of this risk factor with that in other parts of Iran such as Kashan (48.7%), Yazd (24%) and some countries such as Ethiopia (23%) indicate the lower prevalence rate of this disorder. Studies show that increase of HDL-C is effective in reduction of cardiovascular diseases and consumption of Omega 3 fatty acids is effective in reduction of cardiovascular disorders by increasing values of HDL-C and consumption of 3 grams of them per day causes reduction of triglycerides in blood [5,20,40,42]. Another studied factor was smoking, which is a predisposing factor for atherosclerosis [43]. The previous studies have shown that smoking causes 17-30% of the cardiac disorders and these disorders occur in smoking people 2-3 times as much as the nonsmoking people. In addition, it is

regarded as one of the risk factors for hypertension [43,46] and causes cardiovascular disorders in more than 80% of cases [43].

New studies show that low values of HDL-C in smoking people are observed more than those in nonsmoking people [45]. In this study, 9.8% of the people were smokers and a significant difference between smoking and gender was observed. The studies in Yazd also showed that 13.1% of the studied people were smokers and men were significantly more than women which is in line with the present study. In another study in Tehran, 23.5% of men and 1.8% of women were smokers and no relationship was found between this factor and cardiac disorders [5]. Other results of this study showed that 86.2% of the study population had at least one of the risk factors. Studies Yazd showed that 85.58% of people had at least one factor and 61.17% had at least two risk factors which were similar to the present study to some extent. The studies in Bushehr also show that 96.6% of men and 98.6% of women had at least one risk factor and 57.2% had at least two risk factors. In addition, the studies in Isfahan reported that 34.3% of men and 32.2% of women had at least one risk factor and 19.3% had at least 2 risk factors which are lower than those of the present study [5].

### **Conclusion**

Considering findings of study indicating high prevalence of some risk factors of cardiovascular diseases such as high rates of LDL-C and total cholesterol and importance of preventing these diseases as one of the most important causes of mortality in Iran, it seems necessary to execute a preventive program for risk factors and consequently reduce cardiovascular disorders.

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**Contributions**

Study design: EA, NS, HMD, MGH  
 Data collection and analysis; Manuscript preparation: EA, NS, HMD, MGH

**Conflict of interest**

"The authors declare that they have no competing interests."

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