

Gender Differences in the Prevalence of Cardiovascular Risk Factors in an Iranian Urban Population

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Abstract: In Iran, more than 40% of mortality is a result of cardiovascular disorders. The aim of this study was compare of cardiovascular risk factors in urban men and women. This cross-sectional analytic study was performed in urban population of Jahrom in 2008-2009. Subjects aged 30 years or older were selected by multi stage random sampling. Serum lipids including total cholesterol, triglyceride, HDL and LDL cholesterol and also fasting blood sugar were measured. Their blood pressure was measured under standard method. Weight and height were measured with light clothes and without shoes. The most prevalent cardiovascular risk factors in men were overweight (41.3%) and hypertension (35.1%) and in women were low HDL cholesterol (51.3%) and overweight (44.4%). The prevalence of obesity and low HDL cholesterol was higher and the prevalence of smoking was lower in women than in men ($p < 0.001$). According to our results, the prevalence of risk factors was high in both genders. So the importance of performing interventional programs such as changes of lifestyle and dietary habits are needed to reduce the risk of cardiovascular diseases.

Keywords: Cardiovascular Disease, Risk Factor, Gender

Introduction

The Cardiovascular Disease (CVD) is one of the most important causes of mortality in the world and the burden of this disease is increasing in all developing countries (Ebrahmsim and Davey-Smith, 2001; Boutayeb and Boutayeb, 2005). Smoking, high blood pressure, lipid disorder, diabetes mellitus (Almdal *et al.*, 2004; Tang *et al.*, 2004; Murphy *et al.*, 2009; Amarenco *et al.*, 2010; Willey *et al.*, 2009), infectious disease such as mycoplasma pneumonia (Pourahmad *et al.*, 2009), low serum adiponectin level (Shojaie *et al.*, 2009a) and inflammation (Jahromi *et al.*, 2010a), low serum level of Annexin-V (Shojaie *et al.*, 2009b) and antiphospholipid antibodies (Jahromi *et al.*, 2013a; 2013b; 2013c; Shojaie *et al.*, 2011; Jahromi *et al.*, 2010b; 2014), are fundamental risk factors of heart disease. In a cohort study, the increased one standard deviation in systolic blood pressure was associated with 35% increment of risk

of CVD (Hadaegh *et al.*, 2011). Also, accumulation of risk factors in one subject increased risk of CVD (Wilson *et al.*, 1987; Aizawa *et al.*, 2004). The high systolic blood pressure was associated with higher risk of CVD mortality (Wang *et al.*, 2009).

Cardiovascular disease is the leading cause of mortality in adults in Iran (Hadi and Rostami-Gooran, 2004). Several studies in Iran showed that the prevalence of CVD risk factors is high in community (Sharifi *et al.*, 2009; Rahmanian and Shojaie, 2011; Bonakdaran *et al.*, 2011). The prevalence of CVD risk factors in Bushehr is high, particularly high truncal obesity, low High-Density Lipoprotein Cholesterol (HDL-C) and high triglyceride (Nabipour *et al.*, 2008). In another study as part of a national survey of non-communicable diseases from the Khorasan province, northeast of Iran, showed that the prevalence of CVD risk factors, mainly low HDL-C and hypertension were high (Azimi-Nezhad *et al.*, 2009).

Iran is a developing country that has had rapid changes in life style. Also, the prevalence of hypertension, diabetes mellitus and metabolic syndrome in Jahrom was high, 35.4, 11.6 and 28.8%, respectively (Rahmanian and Shojaie, 2012; 2011; Rahmanian *et al.*, 2013). Then, we determined gender different of CVD risk factors in Jahrom city, Iran.

Materials and Methods

The adults aged 30 years and over were randomly selected stratified by gender and age from ten urban centers of Jahrom in the south region of Iran and invited to participate in the study. Pregnant and lactating women and/or persons with chronic disease and mental disorders and unable to walk, were excluded. The final sample consisted of 405 males (aged 51.9±13.9 years) and 487 females (aged 48.5±12.9 years).

All subjects (892) answered a demographic and a detailed medical questionnaire. Informed consent was obtained from all adult participants. The research protocol was approved by the Research Committee of Jahrom University of Medical Sciences.

Afterwards, they were subjected to anthropometric, blood pressure and fasting blood sugar and lipid profile measurements. All data were collected during the years 2008 and 2010. All measurements were conducted by a trained physician. Identical standard protocols were used for each measurement explained elsewhere (Rahmanian and Shojaie, 2012).

Body Mass Index (BMI) was categorized as normal (less than 25.0), overweight (25.0-less than 30.0) and obese (30.0 or greater) (WHO, 2000). Hypertension was defined as 140/90 mmHg or greater and/or self reported current treatment with antihypertensive drugs (NIH, 2008). High cholesterol was defined as ≥240 mg/dL, high LDL-cholesterol as ≥160 mg/dL; low HDL-cholesterol as <40 mg/dL for men and <50 mg/dL for women and high triglyceride levels as ≥200 mg/dL (EPDETHBCA, 2001; Shojaei *et al.*, 2011).

Participants were diagnosed with diabetes mellitus if they had fasting blood glucose level of ≥126 mg/dL,

reported a history of diabetes mellitus, or were currently receiving hypoglycemic drugs (ADA, 2006). Subjects, who smoked one or more cigarettes or one cup of water pipe per week, were considered as smokers.

The distribution of Cardiovascular Disease (CVD) risk factors was compared across gender by using the chi square test for the difference between proportions. For continuous CVD risk factors, comparisons were done with the independent t-test.

For categorical CVD risk factors, we used logistic regression to estimate the odds ratio with 95% confidence interval. In all the analyses, a p-value of <0.05 was considered statistically significant. Data analysis was carried out with the SPSS software, version 11.5.

Results

Descriptive characteristics of participants are summarized in Table 1. Women were significantly younger (p<0.001) and lower married (p<0.001), compared to men. Although, women were lower educated than men but this difference was no significant (p=0.053).

In comparison to men, women had significantly a higher mean of BMI, T-C, LDL-C and HDL-C but lower mean of TG (Table 2). But, the mean of systolic blood pressure, diastolic blood pressure and fasting blood sugar did not significantly differ by gender.

Women had significantly a higher prevalence of obesity and low HDL-C but had a lower prevalence of smoker in compared to men (Table 3). But the prevalence of hypertension, diabetes mellitus, hypercholesterolemia and elevated of LDL-C and triglyceride levels were not significantly difference. The most common risk factors were low HDL-C and overweight in women and overweight and hypertension in men, respectively.

In logistic regression analyses, the odds of overweight, obesity, smoking, hypertension, elevated triglyceride, hypercholesterolemia and lower HDL-C significantly differed by gender (Table 4).

Table 1. Gender differences in socio-demographic characteristics of participants

Categorized variables		Male no	%	Female no	%	p
Education	Illiterate	68	16.8	101	20.7	0.053
	Diploma or lower	259	63.9	324	66.6	
	Higher than diploma	78	19.3	62	12.7	
Marriage	Married	387	95.6	411	84.4	<0.001
	Single	14	3.5	20	4.1	
	Widow or divorce	4	1.0	56	11.5	
Continues variable		Mean	SD	Mean	SD	
Age, year		51.87	13.91	48.45	12.86	<0.001

Table 2. Sex differences in mean of cardiovascular risk factors

Variables	Men mean	SD	Women mean	SD	p
Weight, kg	71.7	12.5	66.9	12.2	<0.001
Height, cm	168.8	6.9	156.1	6.1	<0.001
BMI, kg/m ²	25.1	3.9	27.4	4.5	<0.001
SBP, mmHg	127.2	18.3	127.0	20.6	0.876
DBP, mmHg	80.5	11.4	79.9	11.2	0.436
FBS, mg/dL	96.9	32.8	99.2	43.0	0.381
TG, mg/dL	149.9	102.1	137.1	76.3	0.032
T-C, mg/dL	185.9	40.0	195.4	42.7	0.001
LDL-C, mg/dL	112.8	31.0	117.8	32.4	0.019
HDL-C, mg/dL	45.0	10.1	50.2	10.3	<0.001

Table 3. Prevalence of cardiovascular risk factors according to the gender

Variables	Men no	%	Women no	%	p
Smoker	108	26.7	8	1.6	<0.001
Overweight	167	41.3	216	44.4	<0.001
Obesity	40	9.9	121	24.8	
Hypertension	142	35.1	173	35.5	>0.05
Systolic HTN	109	27.0	147	30.2	>0.05
Diastolic HTN	109	27.0	139	28.5	>0.05
Diabetes mellitus	45	11.1	59	12.1	>0.05
High TG	80	19.8	79	16.2	>0.05
High T-C	38	9.4	65	13.3	>0.05
High LDL-C	26	6.4	48	9.9	>0.05
Low HDL-C	131	32.3	250	51.3	<0.001
Smoker	108	26.7	8	1.6	<0.001
Overweight	167	41.3	216	44.4	<0.001
Obesity	40	9.9	121	24.8	
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High TG	80	19.8	79	16.2	>0.05
High T-C	38	9.4	65	13.3	>0.05
High LDL-C	26	6.4	48	9.9	>0.05
Low HDL-C	131	32.3	250	51.3	<0.001

Table 4. Binary logistic regression analysis of gender and cardiovascular risk factors

Variables	OR	CI 95%	p
Normal BMI, reference	1.00		
Overweight	1.44	1.04-2.0	0.028
Obesity	3.22	2.03-5.09	0.000
Smoker	0.04	0.02-0.09	0.000
Hypertension	0.51	0.28-0.95	0.034
High triglyceride	0.55	0.37-0.83	0.005
Hypercholesterolemia	2.34	1.40-3.90	0.001
Low HDL-C	2.92	2.11-4.04	0.000

Women had 3.22 times greater odds of being obese and 1.44 times greater odds of overweight. Also, women had 2.92-fold greater risk of having low HDL-C and more than two-fold greater risk of having hypercholesterolemia compared to men. On the contrary, women had more than twenty three-fold lower risk of being smoking, compared to men ($p < 0.001$). Also,

women had lower risk of having hypertension and elevated triglyceride level than men (near 50%).

The prevalence of combinations of CVD risk factors for both genders is displayed in Fig. 1. Totally 11.3% of women and only 6.9% of men had no cardiovascular risk factor in the population ($p = 0.002$). The most of participants had one or two risk factors (50.9% in women and 51.1% in men).

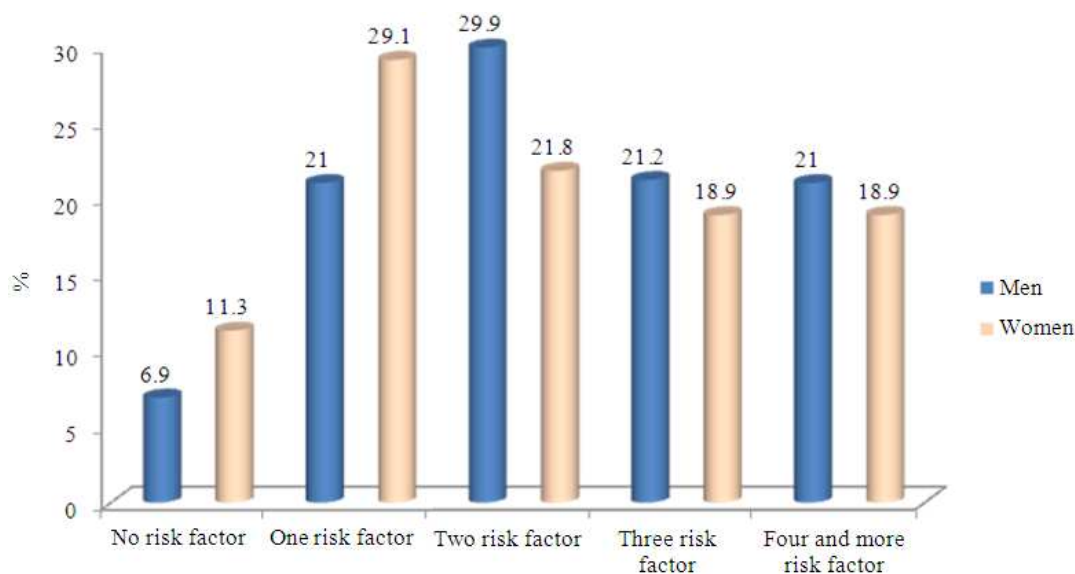


Fig. 1. The frequency distribution of cumulative cardiovascular risk factors among women and men

Discussion

In this study among adults in an urban south region of Iran, we noted a high prevalence of cardiovascular disease risk factors, including obesity, hypertension, dyslipidemia and diabetes mellitus. Several gender disparity in CVD risk factors were observed, particularly high levels of obesity and low HDL-C among women.

Similar to study conducted by (Bahonar *et al.*, 2011) in Isfahan, Iran, in our study women had significantly higher mean BMI, TC, LDL-C and HDL-C and lower TG level compare to men. In the third National Survey of Risk Factors of Non-Communicable Diseases (SURFNCD 2007), only the mean diastolic blood pressure was lower and fasting blood sugar was higher in urban women than in men (Delavari *et al.*, 2009). In another study in Bushehr, women had significantly higher mean serum TC, LDL-C and HDL-C but lower mean triglyceride and DBP and SBP (Nabipour *et al.*, 2008). In contrast to our study, findings from a study in Tanzania, triglycerides, TC, LDL-C and HDL-C levels did not significantly differ by gender. But Tanzanian women had significantly higher mean BMI and lower systolic and blood pressure level, compared to men (Njelekela *et al.*, 2009). Also, (Wu *et al.*, 2011) in their study conducted in Taiwan reported that women had a lower mean of BMI, SBP, DBP, TC and FBS than in men, but a higher mean of HDL-C. In Addis Ababa, the authors reported a higher mean BMI and lower mean of SBP and DBP (Tesfaye *et al.*, 2009).

In this study, we found that prevalence of obesity was higher in women. This result is in agreement with findings from other studies in Great Tunis (Elasmi *et al.*, 2009), Addis Ababa (Tesfaye *et al.*, 2009), China (Yang *et al.*,

2012), India (Gupta *et al.*, 2007) and Iran (Nabipour *et al.*, 2008; Bahonar *et al.*, 2011; Delavari *et al.*, 2009). The higher prevalence of obesity among women may be attributed to socio-cultural factors such as work activity and lifestyle. In contrast to our result, others reported higher prevalence of obesity in men (Wu *et al.*, 2011; Latheef and Subramanyam, 2007) than in women.

Our study showed that prevalence of low HDL-C level was higher in women than men. This finding is consistent to other reports from India (Latheef and Subramanyam, 2007) and is different with result of studies from Iran (Nabipour *et al.*, 2008; Bahonar *et al.*, 2011).

Similar to those reported from Mexico (Meaney *et al.*, 2007), Great Tunis (Elasmi *et al.*, 2009), Addis Ababa (Tesfaye *et al.*, 2009), India (Gupta *et al.*, 2007), China (Wu *et al.*, 2011; Yang *et al.*, 2012) and Iran (Nabipour *et al.*, 2008; Bahonar *et al.*, 2011), in the present study, prevalence of smoking significantly was lower in women than in men.

In opposite to our findings, several studies showed that prevalence of high LDL-C (Nabipour *et al.*, 2008; Bahonar *et al.*, 2011), hypercholesterolemia (Gupta *et al.*, 2007; Latheef and Subramanyam, 2007; Meaney *et al.*, 2007) was higher in women than in men but prevalence of hypertension (Wu *et al.*, 2011; Yang *et al.*, 2012), elevated TG was lower in women than in men.

The most important CVD risk factor was low HDL-C in both gender that the percent of this lipid disorders lower than reported in Zanjan, 2002-2003 (Sharifi *et al.*, 2009). Such finding reported by (Nabipour *et al.*, 2008) in PGHHS in Bushehr, Iran. In study conducted by (Bahonar *et al.*, 2011) the major risk factors in older women was hypertension and obesity and in men was hypertension and overweight. In the study conducted by

Wu *et al.* (2011) lipid disorder was the major risk factor in men and overweight/obesity was the most prevalent risk factor in women.

In logistic regression analysis, we observed higher odds of overweight, obesity, hypercholesterolemia and low HDL-C level among women compared to men, despite significantly lower rates of smoking, hypertension and elevated triglyceride. In urban Tanzanian women, the odds of overweight, hypercholesterolemia, elevated LDL-C and diabetes mellitus did not significantly differ by gender (Njelekela *et al.*, 2009). But women had 4.3 times greater odds of being obese, compared to men. The comparatively lower rates of hypertension among women could be caused by a protective effect of estrogen and lower rates of smoking compared to men.

The limitation of our study was the cross-sectional sampling design does not permit inferences to be drawn relating to the causal relationships among variables. Also, in this study CV risk factors such as BMI, high serum lipid, blood sugar, blood pressure and other risk factors were not analyzed in participant parents or families.

Conclusion

In conclusion, this study auxiliary adds strong facts for the high prevalence of cardiovascular diseases risk factors in Iran, particularly in women. Health promotion, primary prevention and health screening strategies are needed to target hypertension, smoking, lipid disorders and obesity.

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Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

All authors had read and approved the final manuscript:

Abdolreza Sotoodeh Jahromi, Karamatollah Rahmanian and Abdolhossein Madani: Designed the study, carried out data collection, analysis and writing the manuscript.

Mohammad Shojaei: Participated in data collection and contributed to the revision of the manuscript.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

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