



## The Prevalence of Traditional Cardiovascular Risk Factors in Low Socioeconomic People in Birjand 2008 (East of IRAN)

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### ABSTRACT

**Introduction:** Studying the prevalence of cardiovascular risk factors in low socioeconomic groups is of great importance. People who are under the supervision and care of Imam Khomeini Relief Foundation (IKRF) are the most deprived in Iran. The present survey aimed at investigating the prevalence of traditional cardiovascular risk factors among the citizens who are under the supervision of IKRF.

**Materials and Methods:** This cross-sectional study was done on 1008 individuals protected by the IKRF in Birjand in 2008 through multi-stage, random sampling. Demographic data were recorded. Furthermore, blood pressure, waist circumference, weight and height were measured by two trained nurses. Fasting Blood Sugar (FBS) and serum lipids were measured within 12 hours of overnight fasting. Chi-square and T-test were used for data analysis at the significant level of 0.05 using SPSS software (version 15).

**Results:** The mean age of the patients was 39±16.8 years and the most common proved risk factor was dyslipidemia (72%). The prevalence of hypercholesterolemia and hypertriglyceridemia was 43/2% and 12.7% respectively. Obesity was detected in 32.1%. The prevalence of hypertension (HTN) and diabetes mellitus (DM) appeared to be 13.1% and 6.3% respectively. Smoking was distinguished in 9.8 % of the participants. The prevalence of high Cholesterol (P=0.001), high LDL (P=0.01), low HDL (P<0.001), overweight and obesity (P<0.001) was higher in female, but prevalence of smoking was higher in male (P<0.001).

**Conclusion:** Dyslipidemia, obesity and HTN were the most prevalent risk factors in IKRF supported groups with a low socioeconomic status. Thus, it is necessary to hold effective certain educational programs for all the community. Moreover, the screening of cardiac risk factors must be done for all individuals, particularly for those with a low socioeconomic status.

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### Introduction

Cardiovascular Diseases (CVD) are the leading cause of death in the world and are also among the most expensive healthcare procedures. Yet,

they are among the most preventable ones (1). In comparison to other countries, a higher incidence rate of CVD has been observed in the youth in

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Iran (2, 3).

There are many factors contributing to CVD and hypertension (HTN). For instance, dyslipidemia (DLP), diabetes mellitus (DM), immobility, smoking and obesity are the most common factors which are all modifiable. Therefore, raising public awareness about the risk factors through educational programs has a key, preventive role in this area (4).

A study conducted in Birjand, Iran between 1994 and 2003 revealed an increasing trend of risk factor prevalence among myocardial infarction patients. The study emphasized the necessity of developing an intervention and screening program to be crucial (5).

Fortunately, as a result of a better understanding of the condition during the recent decades, effective steps have been taken so as to prevent heart disease risk factors in Iran. Certain programs such as Isfahan Healthy Heart Program and Tehran Lipid and Glucose Study have helped to serve the purpose (6, 7).

Reported data indicate that Iranian adult population is exposed to a high risk of CAD. According to one study which was conducted on 3000 healthy adults aged  $\geq 18$  years, the prevalence of DM, smoking and hypercholesterolemia was 6.3%, 21.6%, and 61% respectively. Among these adults, 87% were physically inactive (8).

The association between CVD and mortality on the one hand and the socioeconomic status (SES) on the other, have been reviewed in many western countries (9, 10). In one research, Kanjilal compared the results of four cross-sectional national surveys between 1971 and 2002 in order to assess the trends in CVD risk factors with respect to annual income and educational levels among US adults. The obtained results showed that the prevalence of smoking and diabetes had deteriorated in individuals with a lower socioeconomic status (9). In another study, Huisman estimated that according to a 12-year follow-up period (1991-2003), SES contributed to the occurrence of myocardial infarction. The results of this study noted that education is a strong preventing factor of acute myocardial infarction (AMI) (10).

Several studies in developing countries including Iran suggest that coronary risk factors might be associated with SES and urbanism (11-13).

The aim of this study was to assess the prevalence of cardiac risk factors in a low-income sector of the community supported by Imam Khomeini Relief Foundation (IKRF) of the South Khorasan, Iran. Imam Khomeini Relief Foundation (IKRF) branch in the South Khorasan in Birjand, Iran cooperated with us in doing the research in 2008. The foundation, as the first leading supporting organization in the country,

provides care for more than 4.5 million of the deprived people (14). This committee protects destitute people by meeting their primary needs and acts as a shelter for orphans, widows and senior citizens with disabilities as well.

## Materials and Methods

The present cross-sectional study was done in Birjand, located in the Eastern part of Iran, on 1008 men and women aged between 15 and 65 years in 2008. Multistage, randomized cluster sampling method was used. The study was conducted in 2 urban regions of Birjand which were under the supervision and care of IKRF (Total population = 18452).

Regarding the existence of two sections of IKRF in Birjand (i.e. one committee in district I and another in district II), the list of individuals having the criteria for participating in the study was obtained from the committees. Upon applying the randomized, multistage cluster sampling method, the sample size was determined with respect to the population in each district.

Clinical examinations of the samples were done by trained physicians and nurses.

A structured questionnaire was used for data collection. Demographic data (age, sex, tobacco use), family history of CVD, known history of cardiac risk factors (DM, HTN and dyslipidemia), height, weight, waist circumference and blood pressure were standardly measured. Body Mass Index (BMI) of each subject was also calculated.

The educational level of the participants were categorized as into illiterate and literate (i.e. below diploma, high school diploma and academic education).

Moreover, written ethical approval was obtained from the Ethics Review Committee in Birjand University of Medical Sciences before the research. A written informed consent was obtained from every subject before starting the tests.

After a 12 hour fasting, a sample of 5cc blood was taken from the right brachial vein of each subject and sent to the central laboratory of Imam Reza hospital in Birjand.

Total serum cholesterol (TC), triglyceride (TG) and glucose were measured through the standard enzymatic method (Pars Azmon kit, Iran). Plasma low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) levels were measured using commercially available enzyme assay kits (Pars Azmon kit, Iran).

In the current study, cardiovascular risk factors were defined as the followings (15):

Overweight; BMI between 25- 29.9 kg/m<sup>2</sup>, Obesity; BMI  $\geq 30$  kg/m<sup>2</sup>, HTN; Systolic Blood

Pressure (SBP)  $\geq$  140 mmHg or Diastolic Blood Pressure (DBP)  $\geq$  90 mmHg.

DM; FBS of  $\geq$  126 mg/dl, Hypercholesterolemia; total cholesterol of  $\geq$ 200 mg/dl, Hypertriglyceridemia; triglyceride  $\geq$ 200 mg/dl, Low HDL; HDL  $\leq$ 40 mg/dl in males and HDL  $\leq$ 50 mg/dl in females and Dyslipidemia (DLP).

Those who smoked one or more cigarettes per day were accounted as smokers.

### Statistical Analysis

Statistical analysis was done using SPSS (V: 15). Differences in various qualitative data were tested by Chi-square, T-test and Logistic Regression. P value was less than 0.05 which was considered as significant.

### Results

The present study was conducted on 1008 subjects (430 men and 578 women). The participants aged between 15 and 65 years and their mean age was  $39 \pm 16.8$  years. Among the subjects, 37.4% were under 30 years old and 83.6% were illiterate or had an education level below high school diploma. Demographic data of the participants is shown in Table 1.

Previous history of DM, HTN, dyslipidemia, ischemic heart disease and family history of Coronary Artery Diseases (CAD) are shown in Table 1. Only 13.5% had a history of dyslipidemia (DLP) while 9.9% were known as hypertensives and 4.8% had DM.

**Table 1.** Demographic data of study participants

Variable	Number	Percent %
<b>Sex</b>		
Male	430	42.7
Female	578	57.3
<b>Age (year)</b>		
< 30	377	37.4
30 -39	115	11.4
40 - 49	169	16.8
50 - 59	202	20
$\geq$ 60	145	14.4
<b>Job</b>		
Unemployed	754	74.8
Worker	162	16
Housewives	4	0.4
Student	88	8.7
<b>Marital status</b>		
Married	498	49.4
Single	355	35.2
Widow	102	10.1
Divorced	53	5.3
<b>Educational status</b>		
Illiterate	373	37
Under diploma	470	46.6
Diploma	104	10.3
Academic education	61	6.1
<b>Previous history of</b>		
Hypertension	100	9.9
Dyslipidemia	136	13.5
Diabetes mellitus	48	4.8
Known CAD	73	7.2
Family history of CAD	163	16.2

### Cardiac Risk Factors

The prevalence of cardiac risk factors in our population is shown in Table 2.

In our population, 13.1% were hypertensive, 32.1% were overweight or obese, 72.0% had DLP and 6.3% had hyperglycemia (Table 2).

### Smoking

Smoking was detected in 9.8 % of the participants. There was a significant difference in the prevalence of cigarette smoking between male and female patients (20.8% to 1.7%,  $P < 0.001$ ), as is demonstrated in Table 4. The most prevalent smoking addiction was found at the age range of 40 to 49 years (Table 3). The prevalence of smoking was rather higher among those having a lower education level (14.5%) than the ones with more academic education (7.1%), as is presented in Table 4 and 5.

### Hypertension (HTN)

It was reported that 9.9% of patients had a history of HTN, but the prevalence of systolic and diastolic hypertension among them was 13.1%.

No significant differences were observed between HTN and sex (14.7% in men to 11.9% in women). However, the prevalence of HTN was higher in the older and less educated subjects. ( $P < 0.001$ )

### Obesity

Among the subjects, 32.1% were either overweight or obese (21.4% overweight, 10.7% obese).

A significant difference was found between the overweight and obesity with sex, age, and education level. On the other hand, overweight and obesity were more common among women, more prevalent among 40-49 year olds and illiterates ( $P < 0.001$ ).

**Table 2.** Percentage of the cardiac risk factors in our population

Variable	Number	Percent
<b>Smoking</b>		
Current	99	9.8
Passive	190	18.8
<b>Dyslipidemia</b>		
High Chol	435	43.2
High TG	128	12.7
High LDL	388	38.5
Low HDL	426	42.3
<b>Diabetes mellitus</b>		
BMI		
Underweight	272	27
Normal	412	40.9
Overweight	216	21.4
Obese	108	10.7
<b>Hypertension</b>		
Systolic	105	10.4
Diastolic	89	8.8
Systolic / diastolic	132	13.1

**Table 3.** Comparison of cardiovascular risk factors in different age groups

Risk factor	<40 years N=492	40-49 yr N=169	50-59 yr N=202	60 yr≥ N=145	P-value <sup>2</sup> test X
High TG	26(5.2%)	26(17.9%)	43(21.3%)	33(19.5%)	<0.001*
High Chol	97(19.7%)	100(69)	134(66.3%)	104(61.5%)	<0.001*
LDL High	85(17.2%)	88(60.7%)	129(63.9%)	86(50.9%)	<0.001*
Low HDL	229(46.5%)	44(30.3%)	83(41.1%)	42(71%)	P=0.01*
DM	4(0.8%)	20(13.8%)	27(13.4%)	13(7.7%)	P=0.01*
Overweight	61(12.3%)	33(22.8%)	61(30.2%)	61(36.1%)	<0.001*
Obesity	27(5.4%)	17(11.7%)	29(14.4%)	35(20.7%)	<0.001*
Smoking	14(2.8%)	31(21.4%)	27(13.4%)	27(16%)	<0.001*
Systolic HTN	13(2.6%)	35(24.1%)	38(18.8%)	19(11.2%)	<0.001*
Diastolic HTN	14(2.8%)	27(18.6%)	27(13.4%)	21(12.4%)	<0.001*
HTN	18(3.68%)	40(27.6%)	45(22.3%)	28(16.6%)	<0.001*

**Table 4.** Comparison of cardiovascular risk factors in sex , With OR estimate (Basis for comparison is Male)

Risk factor	Sex		Logistic regression analysis	
	Male N=430	Female N=578	OR (CI 95%)	P-value
High TG	57(13.3%)	71(12.3%)	0.92(0.63-1.33)	P=0.64
High Chol	159(37%)	276(47.8%)	1.56(1.21-2.01)	P=0.001*
LDL High	147(34.2%)	241(41.7%)	1.38(1.1-1.8)	P=0.01*
Low HDL	123(28.6%)	303(52.4%)	2.75(2.11-3.59)	P<0.001*
DM	28(7.2%)	36(6.6%)	0.95(0.57-1.6)	P=0.74
Overweight	72(16.7%)	144(24.9%)	1.65(1.2-2.26)	P<0.001*
Obesity	18(4.2%)	90(15.6%)	4.22(2.5-7.1)	P<0.001*
Smoking	89(20.8%)	10(1.7%)	0.07(0.04-0.13)	P<0.001*
Systolic HTN	49(11.4%)	56(9.7%)	0.83(0.56-1.25)	P=0.38
Diastolic HTN	41(9.5%)	48(8.3%)	0.86(0.56-1.33)	P=0.49
HTN	63(14.7%)	69(11.9%)	0.79(0.55-1.14)	P=0.20

**Table 5.** Comparison of cardiovascular risk factors in Educational level (Basis for comparison is Illiteracy)

Risk factor	Education level		Logistic regression analysis	
	Illiterate N=373 N (%)	Literate N=635 N (%)	OR (CI 95%)	P-value
High TG	73(19.6%)	55(8.7%)	2.57(1.76-3.74)	<0.001*
High Chol	245(65.7%)	190(29.9%)	4.48(3.41-5.89)	<0.001*
LDL High	218(58.4%)	170(26.8%)	3.85(2.94-5)	<0.001*
Low HDL	145(38.9%)	281(44.3%)	0.78(0.61-1.01)	P=0.09
DM	47(12.5%)	17(2.7%)	5.21(2.9-9.2)	<0.001*
Overweight	103(27.6%)	113(17.8%)	1.76(1.3-2.4)	<0.001*
Obesity	59(15.8%)	49(7.7%)	2.25(1.5-3.36)	<0.001*
Smoking	54(14.5%)	45(7.1%)	2.22(1.46-3.37)	<0.001*
Systolic HTN	74(19.8%)	31(4.9%)	4.82(3.1-7.5)	<0.001*
Diastolic HTN	60(16.1%)	29(4.6%)	4(2.52-6.37)	<0.001*
HTN	91(24.4%)	41(6.5%)	4.67(3.2-3.94)	<0.001*

**Dyslipidemia (DLP)**

The overall prevalence of lipid disorders in the study population was 72%. However, only 13.5% of them reported a history of DLP. High cholesterol was observed in 43.2% and high triglyceride in 12.7% of our subjects (Table 2). Between sex, age, educational level, and lipid disorders were observed a significant difference (Tables 3 and 4). As a result, hypercholesterolemia, hypertriglyceridemia, high LDL and low HDL were more common among the elder ones (Table 3). The prevalence of hypercholesterolemia, high LDL and low HDL was more prominent among women. Nevertheless, hypertriglyceridemia levels did not seem to be different between the two sexes. Although hypercholesterolemia, hypertriglyceridemia and high LDL were more common among illiterates, low HDL prevalence did not appear to be different between the literate and illiterate ones (Table 4 and 5).

**Diabetes Mellitus (DM)**

Among the study population, 4.8% had a history of DM. However, high blood glucose (≥126 mg/dl) was diagnosed in 6.3% of our subjects. Diabetes prevalence increased with age and illiteracy but no significant difference was observed between men and women (Table 3 and 5).

**Discussion**

The present study was performed on 1,008 people with a lower social and economic level in the Eastern part of Iran. It was found out that the most common cardiovascular risk factors were: DLP (72%), overweight and obesity (32.1%), HTN (13.1%), smoking (9.8%) and DM (6.3%).

DLP was the most prominent risk factor. However, the number of people who were aware of their high lipid level was noticeably low (13.5%). The percentages of high cholesterol, LDL, triglyceride and low HDL were similar to

those recorded in other parts of the country. In a study conducted on the general population of Gonabad (a city located near Birjand), it was found out that 49.6% of the people had high cholesterol and 45.6% had high LDL (16). Our results were similar to those in the research done in Hamadan, Iran, whose total prevalence of hypercholesterolemia and hypertriglyceridemia was estimated to be 33.7% and 15.6% respectively. DLP, on the other hand, was more prevalent in women than men. DLP growth was in accordance with age in women and men (17). In Homan's study, high cholesterol in low-paid working women was 24.7% (18).

Since there is a linear relationship between cholesterol and heart disease, there is an urgent need for screening programs so as to identify patients with DLP in all individuals above 20 years of age.

Based on a standard protocol, everybody ought to have a healthy diet as well as sufficient physical activity in order to have a standard body condition and weight. Additionally, if necessary, dyslipidemia should be treated according to the professional guidelines.

The second risk factor in our study was obesity (32.1%). Obesity had a direct link with age and was in contradiction with literacy. It has also been observed as more prevalent among educated female subjects.

Although in our study obesity was slightly less prominent factor than that of the normal population, it was the second prevalent risk factor. This was perhaps a result of the diet, physical activity, genetics and environment.

In Hamadan, Iran, approximately 47.2% of the population were either overweight or obese (17).

In the third National Surveys of Risk Factors of Non-Communicable Diseases done in 2007 on 5,287 Iranian adults aged between 15 and 64 years, the prevalence of obesity was 58.6%. Obesity was more noticeable among women (19). It is not clear whether obesity can independently be considered a risk factor or it is associated with cardiovascular diseases and is secondary to high blood glucose, insulin resistance, HTN, DLP and immobility, all being cardiac risk factors which increase in proportion to an increase of BMI in both sexes. At any rate, the growth of obesity in Iran has been rapid during recent years in the middle age group, which increases the probability of cardiac diseases even in the absence of other major risk factors.

Consequently, it is of paramount importance for people of all ages to gain awareness of the side-effects of obesity and try to reach their ideal weight by changing their lifestyle and diet. The present study revealed that 13.1% of the participants had diastolic or systolic HTN.

Hypertension was more noticeable in elderly people. It also had a negative correlation with literacy (the higher the illiteracy, the higher the hypertension). The prevalence of HTN is expressed variously in Iranian studies. For instance, its prevalence in Iran at the age group of 35-65 years proved to be about 47% in men but 55% in women, 8% in Mashhad and 21.2% in factories and office employees in Golestan (20-22).

HTN is a serious health threat against society and an important cause of death or disability.

Certain risk factors such as obesity, DLP and smoking are more evident in people with hypertension and its treatment should encompass these factors as well.

The prevalence of HTN has been reported to be 13.1% and its known history among the participants was 9.9%. This means that 23% of hypertensive patients were diagnosed only during the study and they had not been aware of their condition. Therefore, hypertension screening and treatment must be the primary goal of the preventive cardiovascular programs. The prevalence of HTN in low-paid working women in Jefferson City (USA) was 41.2% (18).

In our study, 9.8% of the participants were smokers (20.8% of men and 1.7% of women).

The smoking rate was proportionate to the subjects' age and was in a negative correlation with their literacy.

Smoking in Iran is reported to have risen from 0.4% to 41% in various subpopulations (23). Other Iranian studies claimed that prevalence rates of tobacco smoking was 27.4% among men and 3.4% among women (24, 25).

Cigarette is the most important preventable cause of death occurring between 35 and 69 years of age in developed countries. Smoking predisposes individuals to atherothrombosis through several mechanisms. In addition to accelerating atherosclerotic progression, long-term smoking may enhance oxidation of LDL and impair endothelium-dependent coronary artery vasodilatation. Thus, a nationwide program for smoking cessation and a comprehensive educational program aimed at informing people about smoking hazards are crucial.

Diabetes prevalence was 6.3% in our study and 4.8% of our subjects had a history of DM. As a matter of fact, 33% of the patients were unaware of their condition. Individuals with a low level of literacy suffer from this disease more than others. Prevalence of diabetes in the present study was mostly compared to that of Isfahan (4.2%) and Khorassan (1.5%). However, it appeared to be more similar to that of Tehran (6.3%) and rather lower than that of Yazd (16.3%) (8,26-28). The prevalence of DM in low-

paid working women in Jefferson City (USA) was 3.18% (18).

## Conclusion

The present research showed that despite the lower economic level of our study group, the rate of cardiac risk factors are approximately equal to that of the entire community. The most common risk factors in IRKF individuals were dyslipidemia, hypertension and obesity; a situation quite similar to that of the general population in Iran.

It seems that the risk factors for cardiovascular disease are epidemic and they tend to spread in all socioeconomic classes of the society. Therefore, a nationwide mobilization is required to diagnose and control the possible threats. For another thing, since these risk factors are more prominent among the illiterate, pervasive community-based education for them could help provides a suitable opportunity to control and reduce such fatal agents.

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## Conflict of interests

The author has no conflict of interests.

## References

1. Azarkar Z, Jafarnejad M, Sharifzadeh G. The relationship between helicobacter pylori infection and myocardial infarction. *Caspian J Intern Med.* 2011; 2:222-5.
2. Kazemi T, Sharifzadeh GR, Zarban A, Fesharakinia A. Comparison of components of metabolic Syndrome in Premature Myocardial infarction in an Iranian Population. A Case Control Study. *Int J Prev Med.* 2013; 4:110-4.
3. Talaei M, Sarrafzadegan N, Sadeghi M, Oveisgharan S, Marshall T, Thomas GN, et al. Incidence of cardiovascular diseases in an Iranian population: The Isfahan cohort study. *Arch Iran Med.* 2013; 16: 138-44.
4. Gharakhanlou R, Farzad B, Agha-Alinejad H, Steffen LM, Bayati M. Anthropometric measures as predictors of cardiovascular disease risk factors in the urban population of Iran. *Arq Bras Cardiol.* 2012; 98:126-35.
5. Kazemi T, Sharifzadeh GHR. Changes in risk factors, medical care and rate acute myocardial infarction in Birjand (1994-2003). *ARYA Atheroscler.* 2006; 1:271-4.
6. Sarrafzadegan N, Baghaei A, Sadri GH, Kelishadi R, Malekafzali H, Boshtam M, et al. Isfahan Healthy Heart Program: evaluation of comprehensive, community-based interventions for noncommunicable disease prevention. *Prev Control.* 2006; 2:73-84.
7. Momenan AA, Delshad M, Mirmiran P, Ghanbarian A, Azizi F. Leisure Time Physical Activity and Its Determinants among Adults in Tehran: Tehran Lipid and Glucose Study. *Int J Prev Med.* 2011; 2:243-51.
8. Hatmi ZN, Tahvildari S, Gafarzadeh Motlag A, Sabouri Kashani A. Prevalence of coronary artery disease risk factors in Iran: a population based survey. *BMC Cardiovasc Disord.* 2007; 7:32.
9. Kanjilal S, Gregg EW, Cheng YJ, Zhang P, Nelson DE, Mensah G, et al. Socioeconomic status and trends in disparities in 4 major risk factors for cardiovascular disease among US adults, 1971-2002. *Arch Intern Med.* 2006; 166:2348-55.
10. Huisman M, Van Lenthe F, Avendano M, Mackenbach J. The contribution of job characteristics to socioeconomic inequalities in incidence of myocardial infarction. *Soc Sci Med.* 2008; 66:2240-52.
11. Rao KD, Bhatnagar A, Murphy A. Socio-economic inequalities in the financing of cardiovascular & diabetes inpatient treatment in India. *Indian J Med Res.* 2011; 133:57-63.
12. Siadat Z, Abdoli A, Shahsanaei A. Association of an adult obesity, blood pressure and smoking behavior with childhood and adulthood socio-economic position. *J Res Med Sci.* 2012; 17:222-8.
13. Donyavi T, Naieni KH, Nedjat S, Vahdaninia M, Najafi M, Montazeri A. Socioeconomic status and mortality after acute myocardial infarction: a study from Iran. *Int J Equity Health.* 2011; 10:9.
14. Sharifzadeh G, Moodi M, Akhbari H. Investigating health status of older people supported by Imam. *Iranian Journal of Ageing.* 2010; 5:52-9. [Persian]
15. Jellinger PS, Smith DA, Mehta AE, Ganda O, Handelsman Y, Rodbard HW, et al. American Association of Clinical Endocrinologists' Guidelines for Management of Dyslipidemia and Prevention of Atherosclerosis. *Endocr Pract.* 2012; 18:269-93.
16. Sarshar N, Ghahramani M, Kianmehr M, Kazemi T, Mokhtarian H, Yaghobi Avval Riabi M. The Study of Serum Lipid Profile in Adults in Gonabad City in 2008. *Ofoogh-e-Danesh Journal.* 2009; 15:57-62. [Persian]
17. Poorolajal J, Zamani R, Mir-Moeini RS, Amiri B, Majzoobi M, Erfani H, et al. Five-year Evaluation of Chronic Diseases in Hamadan, Iran: 2005-2009. *Iran J Publ Health.* 2012; 41:71-81.
18. Homan SG, McBride DG, Yun S. The effect of the Missouri Wisewoman program on control of hypertension, hypercholesterolemia, and elevated blood glucose among low-income women. *Prev Chronic Dis.* 2014; 11:E74.
19. Esteghamati A, Khalilzadeh O, Mohammad K, Meysamie A, Rashidi A, Kamgar M, et al. Secular trends of obesity in Iran between 1999 and 2007: National Surveys of Risk Factors of Non-communicable Diseases. *Metab Syndr Relat Disord.* 2010; 8:209-13.
20. Moeini M, Mokhtari H, Adibi F, Lotfizadeh N, Moeini M. The prevalence of hypertension among the elderly inpatients in alzahra hospital, Isfahan, Iran. *ARYA Atheroscler.* 2012; 8:1-4.

21. Boskabady M, Hassanzadeh AA, Salimi N, Ghamami G, Mazloom R, Hajizadeh S. Study of the level of blood pressure in subjects older than eighteen years in Mashhad. *Physiol Pharmacol*. 2005; 9:195-202.[Persian]
22. Veghari G, Sedaghat M, Maghsodlo S, Banihashem S, Moharloeii P, Angizeh A, et al. Impact of literacy on the prevalence, awareness, treatment and control of hypertension in adults in Golestan Province (northern Iran). *Caspian J Intern Med*. 2013; 4:580-4.
23. Meysamie A, Ghaletaki R, Zhand N, Abbasi M. Cigarette Smoking in Iran. *Iranian J Publ Health*. 2012; 41:1-14.
24. Toghianifar N, Sarrafzadegan N, Roohafza H, Sadeghi M, Eshtrati B, Sadri G. Smoking cessation support in Iran: availability, sources & predictors. *Indian J Med Res*. 2011; 133:627-32.
25. Sarrafzadegan N, Talaei M, Kelishadi R, Toghianifar N, Sadeghi M, Oveisgharan S, et al. The influence of gender and place of residence on cardiovascular diseases and their risk factors. The Isfahan cohort study. *Saudi Med J*. 2012; 33:533-40.
26. Khaledi Far A, Bahonar A, Asadilari M, Boshtam M, Gharipour M, Taghdisi MH, et al. Risk factors of cardiovascular diseases in a worker population in Isfahan province (Isfahan Electricity Production and Distribution Company). *ARYA Atherosclerosis Journal*. 2012; 7:286-91.
27. Azimi-Nezhad M, Ghayour-Mobarhan M, Parizadeh MR, Safarian M, Esmaeili H, Parizadeh SM, et al. Prevalence of type 2 diabetes mellitus in Iran and its relationship with gender, urbanisation, education, marital status and occupation. *Singapore Med J*. 2008; 49: 571-6.
28. Lotfi MH, Saadati H, Afzali M. Prevalence of Diabetes in People aged  $\geq 30$  years: The Results of Screening Program of Yazd Province, Iran, in 2012. *J Res Health Sci*. 2014; 14:87-91.