Trend of Risk Factors Changes for Cardiovascular Diseases in the Elderly Population in Iran

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Abstract

Background: Cardiovascular diseases are the leading cause of death in the world. The aim of this study was to determine the risk factors for cardiovascular diseases among the elderly living in nursing homes in Tehran during 2009 and 2015. **Materials and Methods:** Samples were selected and evaluated from among the elderly population living in nursing homes in Tehran in two time periods of 2009 (n=310) and 2015 (n=310). Data were collected using a researcher-developed questionnaire through a face to face interview and measurement of variables of blood pressure, body mass index, blood sugar and blood cholesterol and triglycerides. **Results:** The prevalence of heart disease, physical inactivity, overweight, high cholesterol, high triglycerides, hypertension, diabetes and smoking were significantly increased during a 7-year period, respectively by 19.9, 24.7, 20.8, 17.1, 13.6, 6.7, 4.7, 3 and 1.1% (P = 0.000). **Conclusions:** In this study, it was found that the prevalence of cardiovascular diseases and its risk factors is high and is on the increase in geriatric sanatoriums in Tehran. Therefore, a detailed and comprehensive planning seems necessary in order to identify, prevent and control the risk factors of cardiovascular diseases.**[GMJ.2017;6(3):240-48] DOI:10.22086/gmj.v6i3.781**

Keywords: Cardiovascular Diseases; Risk Factors; Aged; Nursing Homes

Introduction

As at 2015, there were about 901 million elderly people worldwide (12% of the world population), and this population increased by 3.26% worldwide, on an annual basis. It has been predicted that by 2030, 2050 and 2100, the elderly population will increase to 1.4, 2.1 and 3.2 billion people, respectively [1]. In the Islamic Republic of Iran in 2015, the elderly population accounts for about 10% of the total population and it has been predicted that this figure will increase to about 33% within the next 35 years [2, 3]. Cardiovascular diseases are age-dependent in various forms [4]. With age, physiological changes gradually occur in the cardiovascular system [5]. Cardiovascular disease risk fac-

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tors include non-modifiable factors such as age, sex, race and family history, and modifiable risk factors include obesity, physical inactivity, smoking, hyperlipidemia, hypertension, and diabetes [6-9]. The risk factors have a synergistic effect and the effect of each risk factor is reinforced in combination with other factors [10]. It has been projected that a significant increase in the number of deaths caused by cardiovascular diseases in Eastern Mediterranean countries will be seen by 2020 [5]. For example, mortality rates of 27.1, 34.2, 21.9 and 18.6% have been reported in Tunisia, Syria, Palestine and Turkey, respectively [11]. In Iran, cardiovascular diseases account for more than 40% of deaths [12]. Therefore, there is an urgent need for countries in the region to locally and regionally analyze the prevalence of cardiovascular disease and determine its risk factors [11]. A cross-sectional survey on the prevalence of coronary artery disease risk factors in Iran carried out on 3000 healthy adult men and women indicates that 61% of subjects had one of the following conditions: triglycerides > 200 mg/dl (32%), total cholesterol > 200 mg/dL, LDL-c > 130 mg/dl (47.5%), HDL-c < 35 mg/dl (5.4%), diastolic blood pressure > 90 mmHg (9.1%), systolic blood pressure > 140 mmHg (13.7%) and 87% of them were physically inactive [13]. Another cross-sectional study on seniors in Tehran showed high TC levels (240 mg/dl) in 25.4% of men and 54.9% of women and borderline levels (200–239 mg/dl) in 35.8% of men and 29.8% of women (p < 0.001). In addition, 10% of the study population were currently smokers, 47% were classified at hypertensive (42% of men and 52% of women) and only 34% had normal blood pressure. The prevalence of obesity (body mass index > 30 kg/m^2) was 15% for men and 36% for women. About 55% of men and 94% of women had high waist-to-hip ratios (>0.95 in men and >0.8 in women) [14]. There are a few local studies about trends of cardiovascular risk factors in Iran, but none have focused on seniors in nursing homes [15-18]. The current study examined changes in cardiovascular disease risk factors among the elderly living in nursing homes and compared the data for the years 2009 and 2015.

Materials and Methods

This cross-sectional descriptive study was conducted among 310 elderlies living in nursing homes in Tehran from April to October 2009 and again from July to December of 2015 with the same sample size.

Study Design and Ethical Approval
Medical ethical approval of the study was obtained from the Research Centre for Islamic Azad University, Tehran. Individuals with knowledge of the project's provisions and personal satisfaction were voluntarily evaluated at no charge. Informed written consent was obtained from all participants before data collection.

Subjects
A total of 310 elderly persons living in Tehran nursing homes were selected and evaluated in 2009 and 20015 using cluster sampling, based on inclusion criteria and their willingness to participate in the study. The inclusion criteria include age above 60 years, ability to communicate and give information, and a history of more than a year of permanent residence in a nursing home in Tehran. After completing the informed consent form by all participants, we gathered the data regarding risk factors for all of men and women by researcher-developed questionnaire in the early morning.

Definition and Measurement of Risk Factors
Data were collected through face to face interviews and measurement of blood glucose, height and weight (body mass index), blood pressure and blood fats (cholesterol and triglycerides). In this study, data were collected using a researcher-developed questionnaire, which was developed based on scientific sources and in conjunction with research purposes, and included 14 questions about age, gender, marital status, level of education, smoking, and physical activity. Content validity of the questionnaire was determined using opinions of 10 faculty members and two cardiovascular specialists. Thereafter, the questionnaire was completed in two steps in two-week intervals by 30 elderly people residing in nursing homes. By investigating the Cronbach's

alpha, a reliability coefficient of 0.88% was approved. Moreover, history of heart disease from the patient's record, which was approved by the respective physician, was extracted.

Smoking
Self-reported smoking habits were evaluated during the previous year, and in a study by Vassilaki, the same criterion was used [19]. Physical activity: A 30-min cut-off point was selected for physical activity during the day. The individuals who never had physical activity, less than 30 min physical activity and more than 30 min physical activity during the day were considered sedentary, less active and active people, respectively [20]. At least 30 min of physical activity during the day had significantly positive effect on cardiovascular health [21].

Blood Sugar and Cholesterol and Triglycerides
Blood sugar, cholesterol and triglycerides were measured using glucose oxidase enzyme test, as well as spectrophotometry and Autoanalyser device after 12 h of fasting in a valid laboratory center. Individuals with blood glucose level above 126 mg or individuals diagnosed with history of diabetes or who took hypoglycemic drugs were considered as diabetic patients [22].In this study, serum triglycerides level greater than 150 mg /dL and cholesterol level greater than 200 mg /dL were considered abnormal [23].

Body Mass Index (BMI)
While wearing thin clothes with no shoes, the subjects' weight was measured using an electronic scale made in Germany (dial seca), and the reliability was controlled several times. Also, during the data collection phase, the scale' accuracy was checked on a daily basis and with a weight of 5 kg. Height was measured using a standard meter and thereafter, the BMI was calculated using the formula (weight in kilograms by the square of height in meters). BMI of less than 20 kg/m², between 20 and 24.9 kg/m², between 25 to 29.9 kg/m², 30 kg/m² and above were denied as emaciation, normal weight, overweight, and obesity, respectively [24]. Hypertension: Blood pressure was measured

by the researcher using a standard mercury sphygmomanometer with the cuff number of 14 attached to their right hand in the sitting position after 15 min of rest. The average size in two consecutive turns of blood pressure measurement was entered into the analysis. None of the subjects, one hour before the measurement, consumed alcohol, coffee or cigarettes. The validity of mercury manometer was checked daily using another standard mercury manometer. Those with higher systolic blood pressure of above or equal to 140 mmHg and diastolic blood pressure higher or equal to 90 mmHg or those diagnosed with high blood pressure or took antihypertensive medication, were classified as patients with high blood pressure [25,26]

Data Analysis
Statistical analyses were done using the statistical package for social sciences (SPSS20, SPSS Inc.). Descriptive Student's t-test, chi-square and Fisher exact test. Statistical significance was measured at P <0.05.

Results

The findings of this study showed 42.6 percent (132) were male and 57.4(178) percent were female in 2009, also 40.3 percent (125) were male and 59.7(185) percent were female in 2015. The average ages of the participants were 75.25 ± 7.98 (in 2009) and 78.87 ± 5.65 (in 2015). Independent t-test showed no significant relationship between the two groups (P=0.697). Other demographic factors in 2009 and 2015 are separately presented in Table-1. A total of 29% (n = 90) of elderly people had heart disease in 2009 (55.6% female and 44.4% male), which increased in 2015 to 93.9% (123 people) (51.7% female and 47.2% male). Chi-square test showed significant correlation between heart disease during 2009 and 2015(P<0.001). Prevalence of heart disease, physical inactivity, overweight, high cholesterol, high triglycerides, diastolic and systolic hypertension, diabetes, and smoking were significantly increased during a 7-year period respectively by 19.9, 24.7, 20.8, 17.1, 13.6, 6.7, 4.7, 3 and 1.1% (P<0.001). The highest increase in the risk factor was allotted

physical inactivity (P<0.001). The risk factors status in 2009 and 2015 is shown in Table-2.

Discussion

In the present study, the prevalence of heart disease among the elderly significantly and substantially increased after a period of 7 years (19.9%). Moreover, the prevalence of these diseases was significantly higher in 2015 (39.9%). The prevalence of cardiovascular disease in this study was higher than similar studies in other countries, which could be due to cultural differences [8, 22, 27-29]. In a study by López *et al.*, it was proven that cultural differences have significant direct effect on the incidence of cardiovascular disease and its risk factors [22]. By comparison, the prevalence of cardiovascular diseases in the present study conducted before 2009 was much higher than similar studies in Iran [30, 31]. While the prevalence of these diseases (32.6%) in a study by Mahdavi *et al*. was more and less than that of the present study, respectively in years 2009 and 2015, indicating that the prevalence of cardiovascular disease among Iranian elderly people is on the increase [32]. In Iran, studies are yet to be carried out to determine the status of cardiovascular disease among the elderly. But, in a study from Critchley *et al*. showed that the

prevalence of cardiovascular diseases in the Eastern Mediterranean population is on the increase [11]. The results of follow-up studies on elderly people in other countries showed that the prevalence of cardiovascular diseases among the elderly populations was significantly increased after 5 years of follow-up [8, 28, 33]. Moreover, the results of several studies conducted before the start of old age with continued follow-up until old age, such as Morrison *et al.*'s study after 15 years of follow-up and Strandberget al's after 26 years of follow-up, showed that the prevalence of cardiovascular diseases among the elderly significantly and substantially increased [34, 35]. This finding is consistent with the results of the present study. In this study, more elderly women were diagnosed with cardiovascular disease than elderly men. The results of studies on elderly people in other countries, as well as in Iran showed that the prevalence of cardiovascular diseases in elderly women is significantly more [14, 30, 31, 36-38]. This finding shows the female pattern of these diseases. Thus, the size of women's vessels is smaller than those of men and is associated with released atherosclerosis, which may increase the risk of cardiovascular disease in older women as compared with men [39]. In this study, after a period of 7 years, cardiovascular risk factors (physical inactivity,

Table 1. Demographic characteristics for the years 2009 and 2015 in the studied centers.

Factor	Status	2009		2015		Results
		No.	Percentage	No.	Percentage	
Gender	Male	132	42.6	125	40.3	Fisher P-Value=0.489
	Female	178	57.4	185	59.7	
Marital status	Widowed	248	80.5	257	83.2	c^2=6.97 Df=4 P-Value=0.138
	Married	55	17.9	47	15.1	
	divorced	5	1.6	6	1.7	
Education	Illiterate	240	77.4	2.73	227	c^2=6.70 Df=4 P-Value=0.153
	Less than a diploma	59	19	9.23	74	
	University graduated	11	3.5	9	9	

Table 2. Risk Factors for the Years 2009 and 2015 in the Studied Centers.

Risk Factor		2009		2015		Results
		No.	Percentage	No.	Percentage	
Smoking	Yes	41	13.2	45	14.3	Fisher P-Value=0.000
	No	269	86.8	265	85.7	
BMI	Less than 24.9	192	61.9	128	41.3	c^2=2.05 Df=4 P-Value=0.000
	25-29.9	73	23.5	98	31.6	
	30 and More	45	14.5	84	27.1	
Physical activity	Without Exercise	138	44.5	216	69.7	c^2=2.05 Df=4 P-Value=0.000
	Less than 30 min	115	37.1	84	27.1	
	30 min and More	57	18.3	10	3.2	
Cholesterol	Less than 200	213	68.7	160	51.6	Fisher P=0.000
	200 and More	97	31.3	150	48.4	
Triglyceride	Less than 150	198	63.9	156	50.3	Fisher P=0.000
	150 and More	112	36.1	154	49.7	
Systolic hypertension	Less than 140	226	72.9	211	68.2	Fisher P=0.000
	140 and More	84	27.1	99	31.8	
Diastolic hypertension	Less than 90	234	75.5	213	68.8	Fisher P=0.000
	90 and More	76	24.5	97	31.2	
Fasting blood sugar	Less than 126	272	87.7	262	84.7	Fisher P=0.000
	126 and More	38	12.3	48	15.3	

BMI: Body Mass Index

overweight, hyperlipidemia, hypertension, diabetes, and smoking) were significantly increased. Furthermore, the prevalence of these risk factors in 2015 was considerably high. However, the prevalence of these factors in the present study (in 2015 and 2009) was high as compared with similar studies conducted on elderly populations in other coun-

tries [27-29]. The prevalence of these risk factors in the present study (2015) was higher as compared with other studies in Iran [31, 40]. This finding contradicts studies conducted years before 2009. For example, in a study by Mahdavi *et al*., the prevalence of diabetes, hypertension and smoking was high as compared with the present study, while hyperlipidemia, obesity and lack of exercise was low, as compared with the present study [32]. One of the reasons for the proximity of risk factors in the aforementioned study to the present study includes the fact that these two studies were carried out in recent years. In Iran, no study has been conducted on the status of cardiovascular risk factors among the elderly. Oser *et al*., after 5 years of follow-up of some elderly persons of Indian origin, showed that the prevalence of diabetes, hypertension, obesity, and high cholesterol were significantly increased [33]. Also, about one-third of the subjects had two or more cardiovascular risk factors at the start of the study, which increased to 44% after 5 years. In a study on Spanish elderly, Trujillo *et al*. showed that modifiable risk factors for cardiovascular disease (except smoking) in the elderly after 12 years of follow-up significantly increased, which imposed heavy burden on the country's health services [41]. Moreover, the results of studies conducted before the start of old age and the continued follow-up until old age, such as a study by AlGhatrif *et al*. on elderly people in the South-West of America after 11 years of follow-up, by Morrison *et al*. after 15 years of colleagues follow-up and by Strandberg *et al*. after 26 years of follow-up, showed that cardiovascular disease risk factors increased significantly [34, 35, 42]. In a study conducted on a Korean elderly woman, Kima *et al*. showed that health promotion programs bring about significant positive changes in the overall score of cardiovascular disease risk factors (diabetes, hypertension, cholesterol, triglycerides, obesity) and satisfaction for the elderly [29]. In the present study, among the risk factors after a period of 7 years, the highest increase was observed in physical inactivity. Clarke *et al*. Reported in a study that more than 50% of the elder-

ly living in Canadian nursing homes, lived a sedentary life style and used wheel chair every day [43]. Of course, the inactivity caused by the aging process following the change in their musculoskeletal system is expected [44]. A significant increase was observed in physical inactivity among the elderly in the present study (24.7%) in 2015 as compared with 2009, as well as its higher prevalence (69.7%) as compared with other similar studies is worrisome [20, 45]. Several studies have shown that physical activity is one of the most important preventive behaviors in the elderly that can prevent chronic cardiovascular diseases, as well as maintain and enhance their health status [20, 46]. Perhaps the reason for the increase in risk factors for cardiovascular disease in the samples of the present study can be attributed to lack of a coherent health promotion program in nursing homes. This was a nursing-home based study with a relatively small sample size, which was limitation of the study. A prospective study with a larger sample would have validated the results further.

Conclusion

Finally, the results of this study showed that the prevalence of cardiovascular disease and its risk factors in geriatric sanatoriums in Tehran is significantly high. Also, after a seven-year period, the disease and its risk factors significantly and substantially increased. Therefore, a detailed and comprehensive planning seems necessary in order to identify, prevent and control the risk factors for cardiovascular disease, especially in nursing homes. Informing people of their status and subsequent intervention can help to curb the spread of these factors. Encouragement of the elderly to increase their physical activity is also strongly recommended. However, the results of this study could help reverse the increasing morbidity and mortality process in age-related cardiovascular diseases.

Conflict of Interest

The authors do not declare any conflict of interests.

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