

Socioeconomic characteristics and controlled hypertension: Evidence from Isfahan Healthy Heart Program

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Original Article

Abstract

BACKGROUND: Hypertension is a major risk factor for cardiovascular diseases. It affects approximately 18.0% of Iranian adults. This study aimed to estimate age-adjusted prevalence of hypertension and its control among Iranian persons older 19 years of age. It also tried to find and socioeconomic factors associated with hypertension control in Iranian population.

METHODS: In Isfahan Healthy Heart Program (IHHP) subjects were selected by multistage random sampling. The participants completed questionnaires containing demographic information, lifestyle habits, medical history, and consumption of relevant medications, especially antihypertensive agents. Income, marital status, and educational level were considered as socioeconomic factors. Hypertension was defined as systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg, or taking antihypertensive medications. Controlled hypertension was considered as systolic blood pressure < 140 mmHg and diastolic blood pressure < 90 mmHg among hypertensive subjects.

RESULTS: The prevalence of hypertension and controlled hypertension was 18.9% and 20.9%, respectively. We found significant relationships between hypertension and marital status, education, and income. At age ≥ 65 years old, odds ratio (OR) was 19.09 [95% confidence interval (CI): 15.01-24.28] for hypertension. Middle family income (OR: 0.71; 95% CI: 0.58-0.87) and education level of 6-12 years (OR: 0.29; 95% CI: 0.25-0.35) were significantly associated with increased risk of hypertension ($P = 0.001$). Among subjects aging 65 years old or higher, the OR of controlled hypertension was 2.64 (95% CI: 1.61-4.33). Married subjects had a higher OR for controlled hypertension (OR: 2.19; 95% CI: 1.36-3.52). Obesity had no significant relationships with controlled hypertension.

CONCLUSION: The IHHP data showed significant relationships between some socioeconomic factors and controlled hypertension. Therefore, as current control rates for hypertension in Iran are clearly unacceptable, we recommend preventive measures to control hypertension in all social strata of the Iranian population.

Keywords: Socioeconomic Factor, High Blood Pressure, Control

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Introduction

Hypertension is a serious public health problems in Iran with a prevalence of approximately 18.0% in Iranian adults.^{1,2} Since hypertension increases the

risk of non-communicable diseases such as heart disease and stroke, it is considered as the most important cause of death among Iranian population.^{3,4} Numerous studies have documented

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the prevalence of hypertension in Iran during different periods.^{1,5,6} It seems that between 2000 and 2007, the prevalence of hypertension did not change, but control of hypertension increased among individuals with hypertension.¹ Although awareness, treatment, and control of hypertension significantly improved from 2001 to 2007, almost half of adults with hypertension did not have controlled blood pressure.^{2,7} As hypertension plays an important role in cardiovascular diseases (CVD), the Isfahan Healthy Heart Program (IHHP), a community-based intervention program, was designed and implemented to prevent CVD and control its related risk factors by promoting healthy lifestyle.⁸ The IHHP used high risk intervention strategies on general population to prevent CVD. This study aimed to estimate the prevalence and control of age-adjusted hypertension among persons over 18 years of age and to determine their relationship with socioeconomic disparities in Iranian population.

Materials and Methods

As a secondary analysis of the IHHP, this study was conducted by Isfahan Cardiovascular Research Center (Isfahan, Iran). Full details of the program have been reported elsewhere.⁹ Data of the last phase (2007) was used in this study. The methods were in accordance with ethical standards of the ethics committee of Isfahan Cardiovascular Research Center. Trained interviewers completed questionnaires for each subject. The questionnaire contained demographic information, lifestyle habits,¹⁰ medical history, and consumption of relevant medications especially antihypertensive agents. Subsequently, the participants were invited to certain health centers where physical examination and blood sampling (after 12-14 hours of fasting) were carried out.¹¹

Marital status, education level, occupation, and income were considered as socioeconomic factors. Based on the Iranian education system, education was categorized as 0-5, 6-12 and more than 12 years. Monthly incomes of less than 300000, 300000 to 500000, higher than 500000 were considered as low, middle, and high, respectively. Since the definition of marriage varies according to different cultures, we categorizes the participants only as married and single (including separated, divorced, and widowed).

Blood pressure was calculated by averaging two blood pressure readings taken during the physical examination in the IHHP examination center.¹ Hypertension was defined as having systolic blood

pressure (SBP) ≥ 140 mmHg, having diastolic blood pressure (DBP) ≥ 90 mmHg, or taking antihypertensive medications.¹ Controlled hypertension was defined as SBP < 140 mmHg and DBP < 90 mm Hg among hypertensive patients. The prevalence of hypertension and controlled hypertension was analyzed based on demographic factors (sex, age, marital status, education level, and family income) and health factors (diabetes and obesity).

Univariate t-tests were used to assess significant differences between groups. All significance tests were two-sided (level of significance = 0.05). Multivariate regression tests were used to determine prognostic factors for hypertension and controlled hypertension.

Results

The prevalence of hypertension and controlled hypertension among our participants was 18.9% and 20.9%, respectively. In 2007, there were significant relations between the prevalence of hypertension and age, marital status, education, income, diabetes, and obesity (Table 1). The prevalence of hypertension increased with increasing age and decreased with higher education and income level. Diabetic subjects had a significantly higher prevalence of hypertension than those without diabetes (51.9% vs. 15.3%). A similar difference was observed between obese and non-obese individuals (32.7% vs. 14.3%).

The overall age-adjusted prevalence of controlled hypertension among hypertensive subjects was 20.9% (Table 2). Unemployed 19-44 year-old individuals with higher education had a lower prevalence of controlled hypertension than older subjects. The prevalence of controlled blood pressure in women was significantly higher than men (29.2% vs. 12.7%; $P = 0.001$). Obese and non-obese participants did not have a significant difference in terms of controlled hypertension (21.5% vs. 20.2%).

Univariate analysis showed that poor control of hypertension was related only with employment among all social factors. Middle-income patients had approximately two times higher probability to have controlled hypertension than uncontrolled hypertension (unadjusted odds ratio: 1.99; 95% confidence interval: 1.2-3.31).

Multivariate logistic regression showed older patients (≥ 65 years old) to have more than fifteen fold increased risk for hypertension than younger patients (adjusted odds ratio: 14.96; 95% confidence interval: 11.11-20.14).

Table 1. Sociodemographic characteristics of the participants with controlled and uncontrolled hypertension

Characteristics	Uncontrolled hypertension		Controlled hypertension	
	n (%)	OR (95%CI)	n (%)	OR (95%CI)
Sex				
Female	404 (17.6)	Reference	116 (29.2)	Reference
Male	404 (18.0)	1.02 (0.88-1.19)	51 (2.7)	0.35 (0.25-0.51)*
Age (years)				
19-44	227 (7.2)	Reference	27 (12.0)	R
44-64	341 (35.4)	7.10 (5.88-8.59)	77 (23.0)	2.19 (1.36-3.52)**
≥ 65	240 (59.6)	19.09 (15.01-24.28)*	63 (26.5)	2.64 (1.61-4.33)*
Marital Status				
Married	660 (19.2)	Reference	133 (20.5)	Reference
Single	148 (13.6)	1.51 (1.25-1.83)*	34 (23.0)	1.16 (0.76-1.78)
Education (years)				
0-5	486 (30.5)	Reference	110 (22.9)	Reference
6-12	235 (11.5)	0.29 (0.25-0.35)	42 (18.1)	0.74 (0.50-1.11)*
> 12	85 (9.6)	0.24 (0.19-0.31)	15 (17.9)	0.73 (0.40-1.33)
Employment				
Housewife	381 (19.7)	Reference	109 (29.1)	Reference
Manual jobs	120 (12.8)	0.59 (0.48-0.75)*	8 (6.7)	0.17 (0.08-0.37)*
Non-manual jobs	129 (15.6)	0.75 (0.60-0.93)	16 (12.5)	0.35 (0.19-0.62)
Retired	134 (53.2)	0.27 (0.27-1.37)	29 (22.1)	0.57 (0.37-0.89)**
Unemployed	32 (11.5)	-	2 (6.3)	-
Student	5 (1.9)	-	1 (20.0)	-
Family income				
Low	619 (19.5)	Reference	122 (19.9)	Reference
Middle	141 (14.7)	0.71 (0.580-0.87)	37 (26.4)	1.44 (0.94-2.20)
High	46 (12.2)	0.57 (0.42-0.79)	8 (18.2)	0.89 (0.41-1.97)
Obesity				
No	520 (14.3)	Reference	104 (20.2)	Reference
Yes	269 (32.7)	2.90 (2.44-3.45)*	57 (21.5)	1.58 (0.75-1.55)

OR: Odds ratio; CI: confidence interval * P value obtained from chi-square test.

** Data expressed as OR (95% CI) was obtained from univariate logistic regression

Table 2. Associations between social factors and controlled hypertension among the studied population

Variable	Uncontrolled hypertension		Controlled hypertension	
	OR (95% CI)	P	OR (95% CI)	P
Sex				
Male/female	2.05 (1.24-3.39)	0.005	0.32 (0.12-0.93)	0.036
Age (years)				
19-44	Reference	Reference	Reference	Reference
44-64	5.29 (4.25-6.59)	< 0.001	2.20 (1.29-3.74)	0.004
≥ 65	14.96 (11.11-20.14)	< 0.001	3.36 (1.80-6.29)	< 0.001
Marital status				
Married vs. single	0.93 (0.73-1.19)	0.582	0.66 (0.40-1.10)	0.108
Education (years)				
0-5	Reference	Reference	Reference	Reference
6-12	0.88 (0.70-1.11)	0.286	1.36 (0.83-2.25)	0.228
> 12	0.89 (0.63-1.26)	0.512	1.48 (0.67-3.30)	0.332
Income				
Low	Reference	Reference	Reference	Reference
Middle	1.06 (0.83-1.35)	0.662	1.99 (1.2-3.31)	0.008
High	1.00 (0.68-1.47)	0.986	1.45 (0.58-3.62)	0.424
Job				
Housewife	Reference	Reference	Reference	Reference
Manual jobs	0.57 (0.33-0.96)	0.035	0.67 (0.22-2.05)	0.477
Non-manual jobs	0.52 (0.31-0.89)	0.017	1.04 (0.34-3.18)	0.944
Retired	-	-	-	-
Unemployed	-	-	-	-
Student	-	-	-	-
Comorbid disease				
Obesity	2.34 (1.91-2.87)	< 0.001	0.96 (0.65-1.42)	0.842

OR: Odds ratio; CI: confidence interval

Data expressed as OR (95% CI) was obtained from multivariate logistic regression adjusted for other variables. Variables entered in the model were sex and age in the first step and marital status, educational level, income, job, diabetes, and obesity in the second step.

Discussion

The results of this study demonstrated significant relationships between socioeconomic factors, such as income and education, and controlled hypertension. We found older housewives with lower education to have a greater tendency to control their hypertension. On the other hand, obesity and diabetes were not related with controlled hypertension. Unlike our results, other studies showed controlled hypertension was much less common among older persons and ex-smokers.¹²

In the present study, controlled hypertension was more common among subjects with middle income. However, in contrast with other studies, we failed to establish a significant relationship between income and controlled hypertension. A previous research suggested patients at higher income level to have better awareness and treatment.¹³ Apparently, better awareness and control of hypertension have no strong relationship with income among Iranian population. According to our findings, lower level of education (e.g. having primary school degree) was associated with awareness about control of hypertension. This is justifiable considering the role of mass media in improving self-care and self-awareness among the target audience. Controlled hypertension was more common among subjects aware of their hypertension diagnosis and those who undertook lifestyle modification.¹² Tian et al. reported controlled hypertension to be much less common among older persons and ex-smokers.¹²

Many studies have shown interactions between blood pressure and socioeconomic factors, lifestyle, and female hormones. Improved lifestyle following the implementation of IHHP interventions¹⁴ resulted in significantly better awareness, treatment, and control of hypertension in all groups with different body mass indexes (BMI).¹ Nevertheless, Khosravi et al. emphasized on the necessity of further educational programs on hypertension control for Iranian youth.¹ Additionally, the First National Health and Nutrition Examination Survey revealed that compared with younger hypertensive individuals, older patients have a lower control rate despite being equally likely to be treated.¹⁵⁻¹⁷ On the contrary, another study reported higher awareness and control rates among older hypertensive people and found patients of younger age to be under-treated.¹⁸ Therefore, close monitoring of blood pressure and relevant adjustment of ntihypertensive treatment are necessary to reduce the risk of

cardiovascular events in patients.¹⁹

Obesity seems to have be associated with uncontrolled hypertension among male hypertensive patients of higher age. In women, on the other hand, abdominal obesity (high waist circumference) plays a major role.²⁰ In fact, a strong relationship between decreased abdominal obesity and controlled hypertension has been reported specifically in women.²¹ Many studies proposed the benefits of comprehensive programs to improve blood pressure control after identification, follow-up, and lifestyle modification in hypertensive subjects.²²

Conclusion

As current control rates for hypertension in Iran are clearly unacceptable, lifestyle modifications, i.e. maintaining a healthy body weight, adopting a diet rich in fruits, vegetables, and low-fat dairy products with reduced levels of saturated and total fat, reducing sodium intake, and participating in regular aerobic physical activity, are recommended in all social groups.

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Conflict of Interests

Authors have no conflict of interests.

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