

Prevalence of Hypertension and Its Relationship with Health Complaints in Elderly Iranians: A Multi-Site Community-Based Study

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Received 2016 November 17; Revised 2016 December 18; Accepted 2017 January 11.

Abstract

Background: The prevalence of Hypertension (HTN) in developing countries might have a different pattern in different countries.

Objectives: This study aimed at investigating the current pattern of HTN and evaluating its relationship with health complaints in elderly Iranian individuals in 2012.

Methods: This cross sectional study used multistage sampling to investigate 1350 Iranian elderly subjects (≥ 60 years) living in the community. Those elderly, who had a systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg and/or those who used antihypertensive drugs during the previous two weeks, were considered as HTN. A face-to-face interview was performed using a structured questionnaire, including demographic factors, awareness, treatment and control of HTN, and health complaints for each individual. Chi-square test and multiple logistic regression analyses were applied to detect the most important variables related to HTN.

Results: Hypertension was seen in 48.5% of individuals. Awareness, treatment, and control of HTN were seen in 40.7%, 82.5%, and 30% of individuals, respectively. Elderly individuals with HTN had significantly more experienced visual disturbances ($P = 0.03$), fecal or urinary incontinence ($P = 0.006$), nocturia ($P = 0.002$), attacks of shortness of breath ($P = 0.004$), and hyperlipidaemia ($P < 0.001$). After adjusting for potential confounders such as ethnicity, nocturia (OR, 1.34; CI 95%, 1.02 - 1.75) and hyperlipidemia (OR, 1.94; 95% CI, 1.5 - 2.51) remained significantly relevant to HTN.

Conclusions: The prevalence of HTN was lower in elderly community-living Iranians than developed countries, yet, was still considerable. Nocturia and hyperlipidemia were the most common health complaints in Iranian elderly with HTN.

Keywords: Prevalence, Hypertension, Health Complaints, Elderly, Iran

1. Background

Hypertension (HTN) is one of the most important causes of mortality worldwide. It has caused the death of more than 9 million people worldwide (1, 2). The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure (JNC 7) declared that about 70% of HTN cases occur in elderly individuals (3). Uncontrolled HTN in the elderly causes frequent awakenings at night to urinate (nocturia) (4), fecal or urinary incontinence (5), depression (6), hyperlipidemia (7), and other physical and psychological disorders with different patterns in the society (8).

The prevalence of HTN in elderly people does not follow the same pattern globally. For example, HTN has a prevalence of 89% in Greek elderly individuals (9), 86% in Spanish elderly individuals (10), 74% in Malaysian elderly individuals (11), 73.9% in Singaporean elderly individuals (12), 59.4% in Chinese elderly individuals (13), and 50% in

Thai elderly populations (14).

Hypertension-related morbidities are of interest to researchers because of the controversies that exist among studies on this subject. McKeigue et al. (2000) (15) reported a relationship between nocturia and HTN in an older population; however, such a relationship was not demonstrated in another study (16). In addition, several studies have reported that there is a strong association between HTN and the risk of dementia, and forgetfulness in elderly people, and this should be considered in prevention programs (17, 18). Furthermore, a relationship between hypertension and risk of hearing loss had been reported elsewhere (19).

Studies conducted in Iran on uncontrolled HTN to date have focused mostly on individuals younger than 65 years (20-23). In addition, studies on elderly populations have been limited to specific areas; therefore, the results might not be generalizable to all Iranian elderly (24, 25). Although the prevalence of uncontrolled HTN in Iranian elderly populations could be estimated as 50% based on re-

views, the exact prevalence of uncontrolled HTN cannot be concluded for recent years as previous reports were all based on data from prior years (26). In addition, complaints related to HTN were not investigated specifically in the abovementioned studies. Therefore, a study on Iranian elderly populations that yields novel, systematic, and comprehensive information about the prevalence of HTN and the most important related complaints is necessary. The present study was conducted with the objective of determining the overall prevalence of HTN and its awareness, treatment, and control and the relationship of overall HTN with the most common health-related complaints in Iranian elderly populations in 2012.

2. Methods

2.1. Participants

In a cross sectional study, the health status of Iranian elderly was evaluated by a multi-site community-based study in 2012 and 1350 participants aged ≥ 60 were investigated. Age and gender distribution of the aged people in Iran were considered for selection of participants in 2012.

2.2. Sample Size

In order to evaluate the health status of aged individuals, we used the following formula for sample calculation in descriptive studies:

$$n = \frac{z_{(1-\frac{\alpha}{2})}^2 \times p(1-p)}{d^2} \quad (1)$$

Where $z_{1-\alpha/2}$ is a standard normal variate (for 95% confidence interval it is 1.96), p was considered as the expected proportion, and d was considered as the precision. Using $p = 0.5$ and $d = 0.05$, 384 participants was estimated as the required sample size. Next, the design effect of the stratified-cluster sampling model was applied with moderate heterogeneity ($DEFF = 1.7$) and the required sample size was enhanced to 653 participants. The anticipated response rate and anticipated eligibility were 0.6 and 0.8, respectively, and according to these rates, the ultimate sample size was 1350 individuals.

2.3. Data Collection

We obtained the required sample size from the residents of 5 out of 31 provinces (Ahvaz, Eastern Azerbaijan, Northern Khorasan, Alborz, and Zahedan). The mentioned provinces were selected because they are a good representative of Iranian elderly in aspect of ethnicity, geography, climate, and culture. As the next step, 66 towns with urban and rural health centers were extracted from chosen provinces, based on official geographical divisions.

The percentage of aged people in each province and town was considered to conduct random cluster sampling in 109 health centers using medical records that included demographic, socio-economic, and health information of all family members especially children, females and aged individuals. Those who had a medical record, but not available for any reason, were substituted with the next eligible person. Almost all elderly in each Iranian family were invited to health centers to examine their health status by general physicians at least once a year. For the purpose of our study, we advised physicians in each health center to collect the required data (Table 1).

2.4. Definitions

For all participants, blood pressure was measured once while resting and for the right hand using a mercury sphygmomanometer by physicians. Those elderly, who had a systolic blood pressure (SBP) of ≥ 140 mmHg and/or diastolic blood pressure (DBP) of ≥ 90 mmHg and/or those who used any antihypertensive drugs during the previous two weeks were considered as HTN and were included in this study (27).

Awareness of HTN was defined as any past diagnosis of HTN reported by family doctors or other health personnel. The treatment of HTN was considered as use of antihypertensive drugs within the last 2 weeks. The control of hypertension was defined as antihypertensive drug use related with a standard SBP less than 140 mmHg and a standard DBP less than 90 mmHg.

2.5. Scale

Next, a questionnaire that contained two parts was used to gather data. The first part collected demographic data including age, gender, occupation, marital status, educational level, place of residence, and ethnicity. The second part had questions about health-related complaints including depression, forgetfulness, visual, and hearing disturbances, fecal or urinary incontinence, nocturia, attacks of shortness of breath, anorexia, and hyperlipidemia, and other psycho-socio-economic assessments are explained in details elsewhere (28).

2.6. Interviewing

Trained researchers present at the health care centers asked the questions. A face-to-face interview was conducted to evaluate the current health situation of selected Iranian elderly. If the elderly were unable to visit the health center, a visiting researcher was available. An informed consent form was attained from all participants, after explaining appropriate information for participants. Study project number and ethical approval code of study were 92390 and 12-92 (date: 04.03.2014), respectively.

Table 1. Distribution of Elderly People and Health Centers Among Six Selected Provinces

Province	Samples, N	Percent	Total Population	Elderly Population	Total Health Centers, N	Selected Health Centers, N
Eastern Azerbaijan	437	32.4	3691000	281020	271	34
Ahvaz	387	28.7	4471000	233960	260	34
Alborz	235	17.4	2289000	142100	13	13
Zahedan	192	14.2	2733000	114200	187	19
Northern Khorasan	99	7.3	838000	60340	58	9
Total	1350	100	14022000	831620	789	109

2.7. Statistical Analysis

Finally, the collected data were entered into the SPSS Software (version 20) for analysis. Independent samples t test was used to evaluate the relationship between HTN and age. Furthermore, Chi-square test was used to analyze the relationship between HTN and categorical variables. Univariate and multiple logistic regression analysis were applied to calculate the odds ratios (ORs) of the target variables with respect to HTN and also determine the most important complaints related to HTN. A $P < 0.05$ was considered as statistical significance.

3. Results

3.1. Characteristics

The mean \pm standard deviation (SD) of 1350 participants was 69.1 (\pm 7.4); 708 participants (52.4%) were male, 952 (70.8%) were married, and 888 (66%) were illiterate. The mean \pm SD of SBP and DBP values were 128.8 (\pm 18.9) and 79.1 (\pm 11.3), respectively.

Of the 1350 individuals studied, 1267 eligible individuals were included after excluding 83 individuals with missing data on anti-hypertensive treatment over the last two weeks. The response rate was 93.1%.

3.2. Prevalence, Awareness, Treatment and Control of HTN

The overall prevalence of HTN among Iranian elderly was determined for 614 participants (48.5%). Using the measurement of BP, from total of 1233 subjects, measured HTN was performed for 437 participants (35.4%). Overall, 40.7% (515/1257) of elderly were aware of their disease. In addition, 82.5% (515/624) were receiving prescribed anti-hypertensive drug, and of those who received treatment, 30% (145/483) became normotensive. Although there was a significant relationship between gender and awareness of HTN, yet, this wasn't the case for age and education level (P

> 0.05). Males were more likely to be aware of their HTN (43.3%, 289/668) compared with females (37.7%, 222/589), ($P = 0.04$). The frequency of HTN awareness in those ≤ 70 years was 41% (329/803), in those aged > 70 years was 40.1% (182/454), which was comparable ($P = 0.75$). In addition, illiterate subjects (41%, 341/831) and those with some level of education (40.6%, 163/401) had a similar proportion for HTN awareness ($P = 0.89$).

3.3. Hypertension and Demographic Variables

There was a significant relationship between HTN and ethnicity, and the ethnicity of Turkman had a lower blood pressure compared to the Azari ethnicity (30.8% vs. 52.7%, $P = 0.007$), while this was not detected for age, gender, occupation, marital status, educational level, and place of residence. Females were more likely to have HTN compared with males (50.9% vs. 45.8%, $P = 0.07$). Employed participants with no pension had a comparable frequency of HTN compared with unemployed elderly with no pension (49.8% versus 46.5%, $P = 0.8$). In addition, although there was no significant relationship between educational level and HTN, the frequency of HTN was decreased by increasing educational level (Table 2).

3.4. Hypertension and Health Complaints

Visual disturbances ($P=0.03$), fecal or urinary incontinence ($P=0.006$), nocturia ($P=0.002$), attacks of shortness of breath ($P=0.004$), and hyperlipidaemia ($P < 0.001$) all had a statistically significant association with HTN. Univariate analysis revealed an increased likelihood of HTN in those, who had visual disturbances (OR=1.28; CI=1.02-1.6), fecal or urinary incontinence (OR=1.66; CI=1.15-2.37), nocturia (OR=1.45; CI=1.14-1.83), shortness of breath (OR=1.47; CI=1.13-1.92), and in individuals with hyperlipidemia (OR=2.05; CI=1.6-2.64) (Table 2). However, depression, forgetfulness, hearing disturbances, and anorexia were not significantly associated with HTN (Table 3).

Table 2. Demographic Characteristics of Iranian Elderly Individuals According to the Presence of Hypertension

Variables	Normotensive ^a	Hypertensive ^a	P Value	Crude, OR (95%CI)
Mean age, ± SD	68.7 ± 7.3	69.4 ± 7.3	0.1	
Gender				
Male	326 (54.2)	275 (45.8)	0.07	1
Female	327 (49.1)	339 (50.9)		1.22 (0.98 - 1.53)
Current occupation				
Employed with no pension	240 (50.2)	238 (49.8)		1.14 (0.86 - 1.5)
Unemployed with pension	103 (51.8)	96 (48.2)	0.8	1.07 (0.75 - 1.52)
Employed with pension	127 (52.0)	117 (48.0)		1.05 (0.76 - 1.47)
Unemployed with no pension	177 (53.2)	154 (46.5)		1
Marital status				
Single	178 (49.0)	185 (51.0)	0.2	1.15 (0.9 - 1.47)
Married	468 (52.6)	421 (47.4)		1
Educational level				
Illiterate	412 (49.8)	415 (50.2)		1.45 (0.61 - 3.44)
Primary	162 (53.8)	139 (46.2)	0.5	1.23 (0.51 - 2.98)
Junior school	30 (58.8)	21 (41.2)		1.01 (0.36 - 2.79)
High school and diploma	33 (52.4)	30 (47.6)		1.31 (0.49 - 3.51)
University and higher	13 (59.1)	9 (40.9)		1
Residence place				
Urban	347 (52.9)	309 (47.1)	0.4	1
Rural	278 (50.5)	273 (49.5)		1.1 (0.87 - 1.38)
Ethnicity				
Azari	255 (47.3)	284 (52.7)		1
Lor	87 (60.0)	58 (40.0)		0.59 (0.41 - 0.86)
Kurdish	21 (42.0)	29 (58.0)		1.24 (0.69 - 2.22)
Balooch	74 (60.2)	42 (39.8)	0.007	0.59 (0.39 - 0.88)
Arab	96 (57.8)	70 (42.2)		0.65 (0.46 - 0.93)
Turkman	9 (69.2)	4 (30.8)		0.39 (0.12 - 1.31)
Fars	87 (47.5)	96 (52.2)		0.99 (0.7 - 1.38)
Other	14 (43.8)	18 (56.2)		1.15 (0.56 - 2.36)

^aValue are expersed as N. (%).

3.5. Adjustment

After adjusting for potential confounding factors, the variables of ethnicity, nocturia, and hyperlipidemia had a significant association with HTN. The likelihood of HTN was significantly higher in individuals, who had nocturia (OR, 1.34; CI 95%, 1.02 - 1.75) and hyperlipidemia (OR, 1.94; 95% CI, 1.5 - 2.51; Table 4).

4. Discussion

The prevalence, awareness, treatment, and control of HTN in Iranian elderly were 48.5%, 40.7%, 82.5%, and 30%, respectively. After adjusting for confounding variables, those who had nocturia and hyperlipidemia were significantly more likely to have HTN.

Previous studies that assessed the prevalence of HTN in developing countries including Iran showed that the prevalence of uncontrolled HTN is increasing (29). In

Table 3. The Physical and Mental Complaints of Iranian Elderly Individuals According to the Presence of Hypertension, Results from Univariate Analyses

Variables	Normotensive ^a	Hypertensive ^a	P Value	Crude, OR (95%CI)
Depression				
No	455 (52.8)	406 (47.2)	0.08	1
Yes	179 (47.5)	198 (52.5)		1.24 (0.97 - 1.58)
Forgetfulness				
No	424 (53.8)	364 (46.2)	0.05	1
Yes	216 (47.9)	235 (52.1)		1.26 (1.00 - 1.59)
Visual disturbances				
No	315 (54.9)	259 (45.1)	0.03	1
Yes	330 (48.7)	348 (51.3)		1.28 (1.02 - 1.6)
Hearing disturbances				
No	451 (52.7)	405 (47.3)	0.1	1
Yes	193 (48.5)	205 (51.5)		1.18 (0.93 - 1.5)
Fecal or urinary incontinence				
No	589 (52.8)	526 (47.2)	0.006	1
Yes	56 (40.3)	83 (59.7)		1.66 (1.15 - 2.37)
Nocturia				
No	449 (54.5)	375 (45.5)	0.002	1
Yes	192 (45.2)	233 (54.8)		1.45 (1.14 - 1.83)
Attacks of shortness of breath				
No	520 (53.7)	499 (46.3)	0.004	1
Yes	128 (44.0)	163 (56.0)		1.47 (1.13 - 1.92)
Anorexia				
No	508 (52.1)	467 (47.9)	0.4	1
Yes	138 (49.5)	141 (50.5)		1.11 (0.85 - 1.45)
Hyperlipidaemia				
No	434 (57.6)	320 (42.4)	< 0.001	1
Yes	151 (39.7)	229 (60.3)		2.05 (1.6 - 2.64)

^aValue are expressed as N. (%).

Golestan province, Iran, a cohort study that analyzed 5 800 elderly individuals over 60 years of age demonstrated that more than half of elderly people had HTN (24). In addition, a review on related published articles between 1996 and 2005 estimated that ~ 50% of Iranian individuals aged > 55 years had HTN that somewhat confirmed our result (26). A comparison of the prevalence of HTN in Iranian elderly people with that in other Asian countries revealed that the prevalence differs across Asia. Approximately 40% of Indian and Pakistani elderly individuals have HTN (30, 31), compared with 62.7% of Vietnamese (32), and 82% of Chinese elderly individuals (33). Although HTN was detected in 36% of Malaysian elderly people, this study

included only subjects, who were residents of aged-care homes; therefore this study might have underestimated the true prevalence of HTN in the community (34). In addition, a comparison of the prevalence of HTN in some European and American countries suggests that the prevalence of HTN in these societies is higher than Iranian elderly subjects. Babatsikou and Zavitsanou (2010) reported that the prevalence of HTN in European and American elderly populations ranges from 53% to 72% (35). The prevalence of HTN in elderly individuals was 66.7% in the United States (36), and 58% in Belarus (37).

While the prevalence, treatment, and control of cardiovascular diseases in Iranian elderly have not been well as-

Table 4. Odds Ratios of Different Variables According to the Occurrence of Hypertension in Iranian Elderly Individuals; Result of Logistic Regression After Adjustment for Other Variables

Variables	Crude, OR (95%CI)	Adjusted, OR (95%CI)
Ethnicity		
Azari	1	1
Lor	0.59 (0.41 - 0.86)	0.63 (0.42 - 0.94)
Kurdish	1.24 (0.69 - 2.22)	1.24 (0.66 - 2.32)
Balooch	0.59 (0.39 - 0.88)	0.71 (0.45 - 1.12)
Arab	0.65 (0.46 - 0.93)	0.61 (0.41 - 0.9)
Turkman	0.39 (0.12 - 1.31)	0.24 (0.05 - 1.21)
Fars	0.99 (0.7 - 1.38)	0.9 (0.63 - 1.3)
Other	1.15 (0.56 - 2.36)	0.77 (0.33 - 1.78)
Nocturia		
No	1	1
Yes	1.45 (1.14 - 1.83)	1.34 (1.02 - 1.75)
Hyperlipidemia		
No	1	1
Yes	2.05 (1.6 - 2.64)	1.94 (1.5 - 2.51)

sessed, the proportion of elderly has increased rapidly. The proportion of people aged ≥ 60 years in Iran was 5.4% in 1975 and it is expected to reach 10.5% in 2025 and 21.7% in 2050 (38). The present study showed that awareness, treatment, and control of HTN in Iranian elderly were 40.7%, 82.5%, and 30%, respectively. This is comparable with the findings from Malaysia where 49.3% of participants were aware of their HTN. On the other hand, only 42.4% of Malaysian elderly were currently treated with antihypertensive drugs and 22.6% of those being treated were under control (11). However, the status is different in developed countries. Reports from the US revealed that almost 76% of elderly were aware of their HTN. In addition, the treatment and control of HTN were about 70% and 49%, respectively, that is comparable with our results (39). Our result is also in line with the findings from India regarding the awareness of HTN (52%). However, only 40% of those with HTN were on treatment, and 15% had been controlled in India (40).

Another finding of the present study was that HTN was higher in individuals with hyperlipidemia after adjusting for confounding variables. An increase in serum lipid levels increases blood pressure in the elderly (41). Similarly, Peng et al. (2011) (42) concluded that HTN in Taiwanese elderly people was associated with hyperlipidemia (cholesterol and triglycerides), because, the mean values of such lipid profiles were higher in patients with uncontrolled HTN compared with healthy individuals. Redon et

al. (2008) (43) also reported that HTN is associated with lipid profiles in elderly individuals. Fat distribution in the abdomen and other areas in the body can also play a role in a way that its increase and resultant obesity leads to HTN in the elderly. Eventually, Mello et al.'s study (2011) confirmed that obesity was associated with HTN after adjusting for age and education (44).

Although several epidemiological studies have investigated the association between HTN and nocturia, the underlying cause of such finding is unclear (4). Furthermore, the present study also found higher rate of nocturia in the elderly in a way that the likelihood of HTN was 1.34 times higher in individuals with nocturia, which was statistically significant. It has been reported that HTN can increase the risk of nocturia by two folds, and the presence of these two conditions can simultaneously effect quality of life (45). Similar findings have been reported from elsewhere (46, 47). In addition, a dose-response relationship for all age groups was found between HTN and nocturia with stronger association during old age (48).

4.1. Strengths and Limitations

The strengths of the present study were that it was community-based, with a large sample size, and multi-stage sampling. In addition, people were sampled from different areas and ethnicities, and if the elderly were unable to visit the health center, a visiting physician was available to ask the designed questions. This resulted in higher

response rate and decreased possible bias against individuals, who could not travel easily. Finally, blood pressure was measured using a sphygmomanometer rather than an only self-reported method, as documenting HTN using self-reporting is unreliable (49). As a limitation, to document other health issues in the elderly, the self-reporting method was used, which is subjected to a social desirability bias; and therefore, this should be minimized in future studies (50). In addition, our study might be prone to non-differential measurement errors as some of the participants had hearing difficulties and Alzheimer's disease, and therefore did not precisely respond to the questionnaires. However, availability of expert teams reduced the effect of such errors.

4.2. Conclusion

Although the prevalence of HTN is lower in Iranian elderly populations compared with those in developed countries, the observation that nearly half had HTN is important. Most of the reported health-related complaints were significantly more common in hypertensive individuals compared with normotensive individuals. Nocturia and hyperlipidemia had the most significant association with HTN.

Acknowledgments

We are grateful to the individuals for participating in this study, and the staff of the health centers for their assistance with data collection. We also announce our deep gratitude to Dr Shahram Yazdani for conducting this study. We acknowledge that this research has been conducted with financial support from the Ministry of Health and Medical Education of Iran.

Footnotes

Conflict of interest statement: The authors mentioned that they had no conflicts of interest.

Funding/Support: Kermanshah University of Medical Sciences.

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