

## Prevalence, Awareness, Treatment, and Control of Hypertension in Hormozgan Province, Iran

Marzieh Nikparvar<sup>1</sup>, Hossein Farshidi<sup>1,\*</sup>, Abdolhossein Madani<sup>1</sup>, Roghiye Ezatirad<sup>1</sup>, Mohsen Azad<sup>1</sup>, Tasnim Eghbal Eftekhari<sup>1,2</sup>, Amin Ghanbarnejad<sup>3</sup>, Iran Rostami Gheshmi<sup>1</sup>, Hussein Heshmat Kassem<sup>4</sup>

<sup>1</sup> Cardiovascular Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, IR Iran

<sup>2</sup> Molecular Medicine Research Center, Hormozgan Health Institute, Hormozgan University of Medical Sciences, Bandar Abbas, IR Iran

<sup>3</sup> Social Determinants in Health Promotion Research Center, Research Institute for Health, Hormozgan University of Medical Sciences, Bandar Abbas, IR Iran

<sup>4</sup> Kasr AlAiny Medical School, Cairo University, Cairo, Egypt

### ARTICLE INFO

#### Article Type:

Research Article

#### Article History:

Received: 16 Jan 2018

Revised: 13 May 2019

Accepted: 3 Jun 2019

#### Keywords:

Hypertension  
 Blood Pressure  
 Prevalence  
 Awareness  
 Iran

### ABSTRACT

**Background:** Hypertension is an important cause of stroke and heart and kidney diseases, which account for nearly two-thirds of all mortalities worldwide. Studies conducted in different provinces of Iran have shown that hypertension is common in the country. However, awareness, treatment, and control rates of the disease have been reported to be low in developing countries.

**Objective:** This study aimed to assess the prevalence, awareness, treatment, and control of hypertension in Hormozgan province.

**Methods:** This descriptive study was conducted on 5065 participants older than 18 years. A questionnaire was completed and blood pressure was measured according to the ESC/ESH 2018 guidelines. Systolic Blood Pressure (SBP)  $\geq$  140 mmHg, diastolic Blood Pressure (DBP)  $\geq$  90 mmHg, or receiving any antihypertensive treatment was considered to be hypertension. The data were analyzed using logistic regression, odds ratio, chi-square, and descriptive statistics.

**Results:** The prevalence of hypertension in Hormozgan province was 23.2%. Only 28.3% of the participants were aware of their hypertension; 17.6% were treated and only 7.2% had controlled hypertension. Hypertension was more prevalent in urban areas (28.8% versus 18.1%), but more controlled among the rural population (13.2% vs. 2.4%). The frequency of hypertension increased from 6.2% to 58.9% in 20 - 29 age group compared to the cases older than 70 years, which indicated a linear trend between the increased risk of hypertension and advanced age.

**Conclusion:** The results showed that hypertension was more prevalent in urban areas in south of Iran. Indeed, nearly less than 30% of the participants were aware of their disease and less than 4% of urban population were controlled. On the contrary, almost 13% of the rural population, particularly females, had controlled hypertension.

### 1. Background

Hypertension (HTN) is the most common chronic disorder and the most important preventable risk factor of Cardiovascular Diseases (CVDs) (1). Onset of disease is conspicuous in advanced ages, but HTN statistics have indicated that approximately 50% of CVDs and 15% of CVD mortalities occurred at ages  $<$  65 years (2).

HTN is an important public health challenge worldwide, which is responsible for nearly 7.1 million deaths annually.

It has been estimated that about 17 million deaths occurred because of CVDs worldwide annually, with HTN complications mainly accounting for 9.4 million deaths (3). Evidence has indicated that lowering blood pressure not only reduces the risks of stroke and heart disease events in hypertensive patients, but also improves their quality of life significantly. The rate of HTN is rising in developed countries, such as the USA (4), as well as in many low- and middle-income countries. According to the World Health Organization (WHO) estimates, HTN has become an important health concern in the Asian region, affecting more than 35% of the adult population (5). The worldwide prevalence of HTN has shown regional variations. The

\*Corresponding author: Hossein Farshidi, Jomhuri Blvd, Shahid Mohammadi Hospital, Department of Research and Technology, Cardiovascular Research Center, Bandar Abbass, Iran. Tel: +98-76 33337192, Fax: +98-76 33337192, E-mail: hfarshidi6@gmail.com, hfarshidi@hums.ac.ir.

lowest prevalence was reported in rural India (3.4% in males and 6.8% in females), while the highest was found in Poland (68.9% in males and 72.5% in females) (6). HTN is in fact a non-communicable disease whose prevalence has noticeably increased in the Middle East (7). Iran is a Middle Eastern, middle-income country with diverse ethnicities and lifestyles. Studies in Iran have come to different results. A systematic review of published studies on HTN in Iran estimated its prevalence rate to be 22.1% (8). In the last national study in 2005, 25.2% (6.6 million cases) of Iranian people aged 25 - 64 years had HTN, 45.5% were pre-hypertensive, 34% were aware of their disease, and 25% were taking medications to lower their blood pressure. However, only 24% had controlled blood pressure (9).

## 2. Objectives

The prevalence of HTN has been reported to differ worldwide depending on study methods and populations. This study aims to determine the prevalence of HTN in Hormozgan province where people with different ethnicities reside. This province has a high immigrant population because of its location as a seaport.

## 3. Patients and Methods

### 3.1. Study Design

This cross-sectional, descriptive, population-based study was conducted in Hormozgan province in December 2016. Patients older than 18 years were recruited into the research using random clustered sampling. The clusters were 100 public health centers randomly selected from all health centers in rural and urban areas of Hormozgan province. Totally, 50 individuals were selected from each cluster. Pregnant and lactating women and/or people with chronic diseases, mental disorders, and disabilities were excluded. Written informed consents were obtained from all participants. This study was approved by the Ethics Committee of Hormozgan University of Medical Sciences. The study data were collected using a questionnaire containing demographic and medical information (i.e., history of HTN or taking antihypertensive agents).

### 3.2. Blood Pressure Measurement

Blood pressure was measured at home by trained nurses using Omron® digital blood pressure. This was done after a 15-minute resting period with the arm placed at the heart level in sitting position. Blood pressure was recorded as the mean of two measurements with a 20-minute interval. The first measurement was taken at the beginning and the subsequent one was taken during the interview (after

approximately 20 minutes). If the measurements varied by > 10 mmHg, an additional measurement was performed. The mean of the two measurements was used for data analysis.

### 3.3. Definition

HTN was defined as: a) Systolic Blood Pressure (SBP)  $\geq$  140mmHg and/or Diastolic Blood Pressure (DBP)  $\geq$  90 mmHg according to the ESC/ESH 2018 guidelines (10), b) self-reported HTN, and c) self-reported intake of antihypertensive medications (11).

### 3.4. Statistical Analysis

Categorical variables were presented as frequency and percentage. The association between categorical variables and HTN was assessed using chi-square test. Crude Odds Ratio (OR) was also reported for each variable. Moreover, multiple logistic regression was used to assess the relationship between HTN and age, gender, education level, marital status, occupation, and residential status by estimating the adjusted OR with 95% Confidence Interval (CI). All statistical analyses were performed using the SPSS statistical software, version 16 (Chicago, IL, USA) and  $P < 0.05$  was considered to be statistically significant.

### 3.5. Outcome

Primary outcomes of interest in this study were the overall prevalence of HTN and prehypertension. The ESC/ESH 2018 guidelines (10) were utilized to define the cutoff point for HTN (11).

## 4. Result

This descriptive study was conducted on 5065 participants out of whom, 1178 (23.25%) were hypertensive and 333 (28.3%) were aware of their HTN. Among hypertensive patients, only 17.6% ( $n = 208$ ) were being treated and 7.2% ( $n = 85$ ) had controlled blood pressure (Table 1). Among the 5065 participants, a total of 5038 questionnaires were completed with a response rate of 99.4%.

Among the studied population, HTN was least prevalent in the 18-29 age group (6.2%) and most prevalent in elderly individuals (age > 70 years) (57.8%). Additionally, 25.9% of males and 21.6% of females were hypertensive ( $P > 0.05$ ). Besides, 37.4% of illiterate participants suffered from HTN. Individuals with high stress occupations, such as physicians and engineers, were also hypertensive (22.9%). Office workers had HTN, as well (28.5%). In addition, marital status had a direct effect on HTN (24% in married patients vs. 11.8% in single ones) (Table 2). Moreover, 28.8% of the urban population compared to

**Table 1.** Awareness, Treatment, and Control of Hypertension in Urban and Rural Inhabitants Sub-grouped by Gender (n/%)

	No#	Hypertensive Cases	Awareness (Among Hypertensive Cases)	Treatment (Among Hypertensive Cases)	Controlled Hypertension (Among Hypertensive Cases)
<b>Studied population</b>	5065	1178 (23.25%)	333 (28.3%)	208 (17.6%)	85 (7.2%)
<b>Urban residents</b>	2479	714 (28.8%)	119 (16.7%)	73 (10.1%)	24 (3.4%)
<b>Rural residents</b>	2559	463 (18.1%)	214 (46.2%)	135 (29.2%)	61 (13.2%)
<b>Male urban residents</b>	982	323 (32.8%)	46 (14.2%)	23 (7.1%)	8 (2.4%)
<b>Male rural residents</b>	1075	210 (19.5%)	86 (40.9%)	53 (25.2%)	18 (8.6%)
<b>Female urban residents</b>	1471	397 (27.0%)	73 (18.4%)	50 (16.8%)	16 (4.0%)
<b>Female rural residents</b>	1497	248 (16.5%)	128 (51.6%)	82 (33.1%)	43 (17.3%)

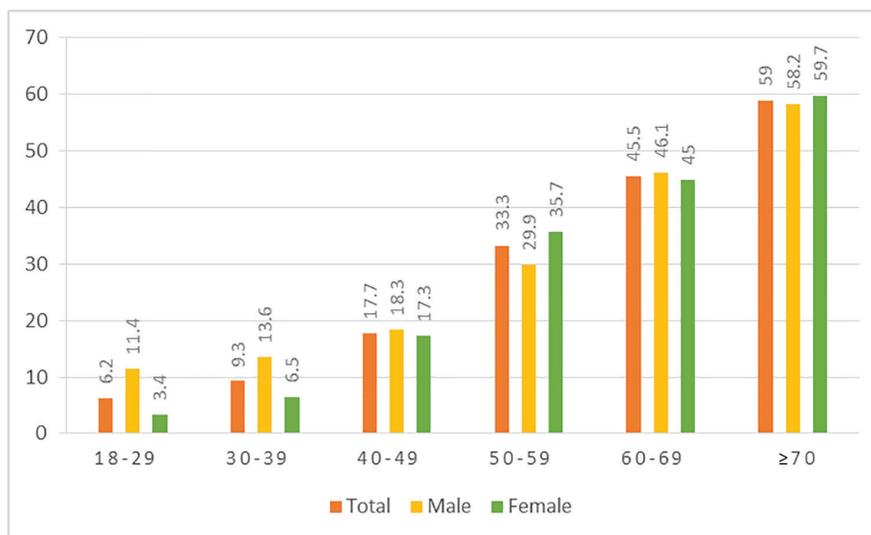
**Table 2.** The Prevalence of Hypertension According to Gender, Place of Residence, Education Level, Occupation, Marital Status, and Age

		Prevalence of Hypertension	Univariate Analysis			Multivariate Analysis		
			Crude OR	95% CI for OR	P value	Adjusted OR	95% CI for OR	P value
<b>Gender</b>	Female	21.6%	1	-	< 0.001 *	1	-	0.18
	Male	25.9%	1.27 *	1.11 - 1.45		1.15	0.94 - 1.41	
<b>Place of residence</b>	Rural	18.1%	1	-	< 0.001 *	1	-	< 0.001 *
	Urban	28.8%	1.78 *	1.56 - 2.03		2.70	2.25 - 3.23	
<b>Education level</b>	Illiterate	37.4%	1	-	< 0.001 *	1	-	0.42
	Primary school	18.8%	0.39 *	0.32 - 0.46		0.90	0.71 - 1.13	
	Middle school	17.8%	0.36 *	0.29 - 0.45		1.06	0.78 - 1.44	
	Diploma	17.1%	0.34 *	0.27 - 0.44		0.92	0.66 - 1.29	
<b>Occupation</b>	Academic	13.4%	0.26 *	0.19 - 0.36		0.72	0.45 - 1.15	
	Jobless	33.6%	1	-	< 0.001 *	1	-	< 0.001 *
	Worker (Blue collar workers)	14.6%	0.34 *	0.25 - 0.45		0.58 *	0.40 - 0.84	
	Construction workers	24.3%	0.64	0.29 - 1.38		1.02	0.40 - 2.60	
	Drivers	24.8%	0.65	0.41 - 1.03		1.14	0.65 - 2.00	
	Office workers	28.5%	0.79	0.60 - 1.04		1.07	0.73 - 1.57	
	Teachers	13.8%	0.32 *	0.17 - 0.59		0.94	0.45 - 1.98	
	Self-employed	31.8%	0.92	0.67 - 1.25		1.75 *	1.18 - 2.60	
	Specialized jobs (physicians, engineers)	22.9%	0.58	0.26 - 1.32		0.58	0.26 - 1.32	
	Homemaker	21.5%	0.54 *	0.44 - 0.67		0.54 *	0.44 - 0.67	
<b>Marital status</b>	Single	11.8%	1	-	< 0.001 *	1	-	0.61
	Ever married (currently married, divorced, widowed)	24%	2.36	1.64 - 3.40		1.12	0.73 - 1.72	
<b>Age (years)</b>	18 - 29	6.2%	1	-	< 0.001 *	1	-	< 0.001 *
	30 - 39	9.3%	1.57	0.96 - 2.56		1.84 *	1.03 - 3.30	
	40 - 49	17.8%	3.23 *	2.02 - 5.35		4.20 *	2.33 - 7.59	
	50 - 59	33.3%	7.58 *	4.66 - 12.33		9.71 *	5.29 - 17.81	
	60 - 69	45.6%	12.76 *	7.8 - 20.89		17.21*	9.20 - 32.21	
	≥ 70	58.9%				30.22 *	15.78 - 57.89	

only 18.1% of the rural population were hypertensive (P < 0.001) (Table 2).

The frequency of HTN increased from 6.2% in the 20 - 29 age group to 58.9% in the cases older than 70 years. This indicated a significant linear correlation between the increased risk of HTN and advanced age (P = 0.0001) (Figure 1). The frequency of HTN in different age groups has been displayed in Figure 1.

The results of univariate and multivariate analyses for assessing the influence of different variables on HTN showed that the risk of HTN increased with age (adjusted OR = 1 in 20 - 29 age group compared to 58.9% crude or 30.22% adjusted OR in cases older than 70 years) (Table 2). Based on the results of multivariate analysis, other factors such as residence in urban or rural areas were significantly associated with HTN (P < 0.001).



**Figure 1.** The Prevalence of Hypertension according to Age and Sex

## 5. Discussion

HTN is a chronic pathological condition, which deteriorates individuals' body organs silently and leads to high morbidity and mortality rates if left uncontrolled or untreated. Prompt diagnosis of this condition is essential in order to prevent morbid consequences. Some people are at risk because of underlying risk factors, such as diabetes, hyperlipidemia, hypertriglyceridemia, metabolic syndrome, smoking, sedentary lifestyle, and diet, which are controllable. Other patients suffer from HTN without any underlying causes, which has been coined as essential HTN. This reflects the impact of ethnicity, race, and impaired genetic function on HTN. Awareness of individuals plays a crucial role in the management and control of HTN as it affects the patients' lifestyle and proper intake of medications for controlling HTN.

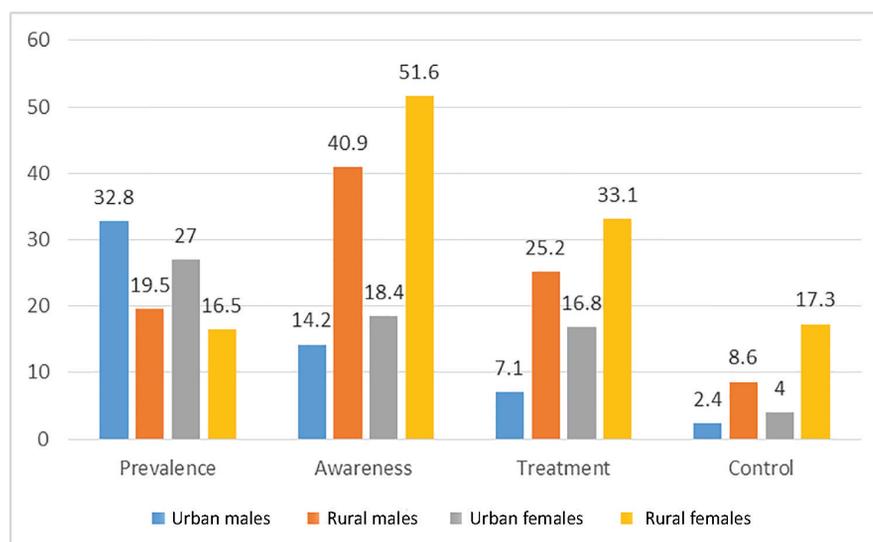
This study assessed the prevalence of HTN, the patients' awareness of their condition, and the underlying risk factors in Hormozgan province, which is a vast area in south of Iran and north of the Persian Gulf. The study was conducted on a random population from urban and rural areas with equal distribution. The high prevalence of HTN in this province (23.2%) was somewhat similar to the measures reported in the previous studies performed in Hormozgan, Tehran (12), Yazd (13), Qazvin, and Fars provinces (14). However, the prevalence was higher in Hormozgan province compared to some provinces and cities, such as Gilan, Khuzaestan, Esfahan, Golestan, Zahedan, and Shahroud (15-18). The prevalence of HTN in south of Iran was similar to national measures. In most epidemiological studies, including the systematic review by Haghdoust et al. (8), various results have been obtained regarding the prevalence of HTN in different years. It seems that regional studies reflect more real data compared to national ones. Furthermore, the prevalence of HTN was much lower in south of Iran in comparison to the countries of southern Persian Gulf peninsula, such as Qatar (32%), Oman (41.5%), United Arab Emirates, and Saudi Arabia (15 - 40%) but close to the prevalence in Egypt (26%) (19-22).

The high frequency of HTN as a risk factor for cardiovascular diseases necessitates prompt diagnosis and essential treatment. In the current study, the prevalence,

awareness, treatment, and appropriate control rates of HTN in the whole province were 23.25%, 28.3%, 17.6%, and 7.2%, respectively (Table 1). The results indicated that the prevalence of HTN was higher in urban areas than in rural areas, which is in line with findings of other national studies (23, 24). However, awareness, receiving medications, and HTN control were more apparent in rural areas, which is on the contrary to the results obtained in other countries. The most important reason for this inconsistency is the structure of Primary Health Care (PHC) in Iran, which has different coverages in rural and urban areas (25). Females are more targeted by PHC in rural areas, which results in lower prevalence, higher awareness, and more attention to HTN treatment and control (Figure 2). Although the obtained results were not desirable in comparison to those from developed countries (26), they were favorable compared to those reported in developing countries. The levels of awareness, treatment, and control of HTN in the present study were similar to those of high-income and developed countries, but different from those of low-income, middle-income, developing, and underdeveloped countries (25).

In the current study, the rate of HTN increased with increase in age in both sexes ( $P < 0.001$ ). Moreover, the results revealed a direct correlation between advanced age and increased prevalence of HTN, which is in line with the findings of national (24) as well as international studies (26). This increase could be attributed to such factors as arterial stiffness and metabolic disorders associated with advanced age.

The rate of HTN was nearly 60% in the population above 70 years old (Table 2). This finding has been confirmed in most studies around the world. In addition, the prevalence of HTN was higher among illiterate people (37.4%) and decreased in those with higher education levels (13.4% in university graduates). Furthermore, only 7.2% of the patients had controlled HTN, and 71.7% were unaware of their condition (Table 1). This indicated that HTN was undiagnosed, poorly controlled, and untreated in south of Iran, which is similar to the findings of other studies conducted on the issue (13, 18, 27). Thus, strengthening and reinforcing the health sector regarding health education



**Figure 2.** The Prevalence, Awareness, Treatment, and Control of Hypertension in the Studied Population

and providing health services is necessary to reduce the burden of HTN and the associated morbidity and mortality.

### 5.1. Conclusion

Improving the quality of life and health education and reducing the risk factors are essential in controlling HTN regardless of people's race and ethnicity.

### 5.2. Limitations

One of the study limitations was that the population of urban areas, especially in Bandar Abbas (capital of Hormozgan province), is not homogeneous and includes different ethnicities. Distant rural areas caused another noticeable limitation for the research team, because some regions were quite difficult to reach.

### 5.3. Ethical Approval

This study was approved by the Research Ethics Committee of Hormozgan University of Medical Sciences (HUMS.REC.1394.174). Written informed consent forms were obtained from the participants and they were ensured about the confidentiality of their data prior to the study.

### Acknowledgements

There is no acknowledgements.

### Authors' Contribution

Study concept and design: H.F. Acquisition of the data: I.R. Analysis and interpretation of the data: M.A. Drafting of the manuscript: R.E. Critical revision of the manuscript for important intellectual content: A.M. Statistical analysis: A.G. Administrative, technical, and material support: T.E. Study supervision: M.N.

### Funding/Support

This study was funded by the Vice-chancellor of Research and Technology, Hormozgan University of Medical Sciences (grant No. 9070).

### Financial Disclosure

The authors have no financial interests related to the material in the manuscript.

### References

- Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *The lancet*. 2005;**365**(9455):217-23.
- Howard G, Prineas R, Moy C, Cushman M, Kellum M, Temple E, et al. Racial and geographic differences in awareness, treatment, and control of hypertension: the REasons for Geographic And Racial Differences in Stroke study. *Stroke*. 2006;**37**(5):1171-8.
- Organization WH. *Global health risks: mortality and burden of disease attributable to selected major risks*. Geneva: World Health Organization; 2009.
- Wang Y, Zhang J, Ding Y, Zhang M, Liu J, Ma J, et al. Prevalence of Hypertension among Adults in Remote Rural Areas of Xinjiang, China. *Int J Environ Res Public Health*. 2016;**13**(6).
- Krishnan A, Garg R, Kahandaliyanage A, editors. Hypertension in the South-East Asia region: an overview. Regional Health Forum; 2013.
- Kearney PM, Whelton M, Reynolds K, Whelton PK, He J. Worldwide prevalence of hypertension: a systematic review. *J Hypertens*. 2004;**22**(1):11-9.
- Saeed AA, Al-Hamdan NA, Bahnassy AA, Abdalla AM, Abbas MA, Abuzaid LZ. Prevalence, Awareness, Treatment, and Control of Hypertension among Saudi Adult Population: A National Survey. *Int J Hypertens*. 2011;**2011**:174135.
- Haghdoust AA, Sadeghirad B, Rezagadehkermani M. Epidemiology and heterogeneity of hypertension in Iran: a systematic review. *Arch Iran Med*. 2008;**11**(4):444-52.
- Esteghamati A, Abbasi M, Alikhani S, Gouya MM, Delavari A, Shishehbor MH, et al. Prevalence, awareness, treatment, and risk factors associated with hypertension in the Iranian population: the national survey of risk factors for noncommunicable diseases of Iran. *Am J Hypertens*. 2008;**21**(6):620-6.
- Williams B, Mancia G, Spiering W, Agabiti Rosei E, Azizi M, Burnier M, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. *European heart journal*. 2018;**39**(33):3021-104.
- Collaboration AC. The 7th Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7). *Hypertension*. 2003;**42**:1206-52.
- Aghaei Meybodi HR, Khashayar P, Rezai Homami M, Heshmat R, Larijani B. Prevalence of hypertension in an Iranian population. *Ren Fail*. 2014;**36**(1):87-91.
- Namayandeh S, Sadr S, Rafiei M, Modares-Mosadegh M, Rajaefard M. Hypertension in Iranian urban population, epidemiology, awareness, treatment and control. *Iran J Public Health*. 2011;**40**(3):63-70.
- Basiratnia M, Derakhshan D, Ajdari S, Saki F. Prevalence of childhood obesity and hypertension in south of Iran. *Iranian journal of kidney diseases*. 2013;**7**(4):282.
- Khosravi A, Emamian MH, Shariati M, Hashemi H, Fotouhi A. The prevalence of pre-hypertension and hypertension in an Iranian urban population. *High blood pressure & cardiovascular prevention*. 2014;**21**(2):127-35.
- Sahraki M, Mirshekari H, Sahraki A, Mohammadi M, Sahraki E, KHAZAEI FA. Hypertension among 30+ year-old people in Zahedan (Southeast of Iran). 2011.
- Shirani S, Kelishadi R, Sarrafzadegan N, Khosravi A, Sadri G, Amani A, et al. Awareness, treatment and control of hypertension, dyslipidaemia and diabetes mellitus in an Iranian population: the IYHP study. *East Mediterr Health J*. 2009;**15**(6):1455-63.
- Yazdanpanah L, Shahbazian H, Shahbazian H, Latifi SM. Prevalence, awareness and risk factors of hypertension in southwest of Iran. *J Renal Inj Prev*. 2015;**4**(2):51-6.
- Abd El-Aty MA, Meky FA, Morsi MM, Al-Lawati JA, El Sayed MK. Hypertension in the adult Omani population: predictors for unawareness and uncontrolled hypertension. *J Egypt Public Health Assoc*. 2015;**90**(3):125-32.
- Bener A, Al-Suwaidi J, Al-Jaber K, Al-Marri S, Dagash MH, Elbagi IE. The prevalence of hypertension and its associated risk factors in a newly developed country. *Saudi Med J*. 2004;**25**(7):918-22.
- El Bcheraoui C, Memish ZA, Tuffaha M, Daoud F, Robinson M, Jaber S, et al. Hypertension and its associated risk factors in the kingdom of Saudi Arabia, 2013: a national survey. *Int J Hypertens*. 2014;**2014**:564679.
- Ibrahim O, Jirjees F, Mahdi H. Barriers affecting compliance of patients with chronic diseases: a preliminary study in United Arab Emirates (UAE) population. *Asian J Pharm Clin Res*. 2011;**4**(2):42-5.
- Azizi F, Rahmani M, Emami H, Mirmiran P, Hajipour R, Madjid M, et al. Cardiovascular risk factors in an Iranian urban population: Tehran lipid and glucose study (phase 1). *Sozial-und präventivmedizin*. 2002;**47**(6):408-26.
- Mirzaei M, Moayedallaie S, Jabbari L, Mohammadi M. Prevalence of hypertension in Iran 1980–2012: a systematic review. *The Journal of Tehran University Heart Center*. 2016;**11**(4):159.
- Chow CK, Teo KK, Rangarajan S, Islam S, Gupta R, Avezum A, et al. Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. *Jama*. 2013;**310**(9):959-68.
- Pereira M, Lunet N, Azevedo A, Barros H. Differences in prevalence, awareness, treatment and control of hypertension between developing and developed countries. *J Hypertens*. 2009;**27**(5):963-75.
- Asadi-Lari M, Sayyari AA, Akbari ME, Gray D. Public health improvement in Iran--lessons from the last 20 years. *Public Health*. 2004;**118**(6):395-402.