

## Research Paper:

# Prevalence of Hypertension and Its Associated Cardiovascular Disease-induced Mortality



Yadollah Ghafuri<sup>1</sup> , Hasan Izanloo<sup>1</sup>, Siamak Mohebi<sup>2</sup>, Abedin Saghaipour<sup>2</sup>, Moharram Karami Joushin<sup>2\*</sup> , Saeed Karimi<sup>2</sup>

1. Research Center for Environmental Pollutants, Qom University of Medical Sciences, Qom, Iran.

2. Department of Health Education and Promotion, Faculty of Health, Qom University of Medical Sciences, Qom, Iran.



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## ABSTRACT

**Background and Aim:** Hypertension is among the most well-recognized controllable risk factors for cardiovascular diseases. Thus, the current study aimed to determine the prevalence of hypertension and its associated cardiovascular disease-induced mortality in the middle-aged and elderly populations.

**Materials and Methods:** This cross-sectional study examined 722836 middle-aged and elderly subjects of Qom Province, Iran (approximately 15% of the total population, aged >30 years) referring to comprehensive healthcare service centers from 2017 to 2019. In this study, due to the adjusted risk ratio, the share of mortality due to cardiovascular diseases attributed to hypertension was estimated indirectly.

**Results:** The prevalence of hypertension in the study population was reported to be 16.2%, i.e., estimated as 10% among the middle-aged and 42% among the elderly. The obtained data suggested that in patients with hypertension, the process of controlling and monitoring blood pressure in women, compared to men; the elderly, compared to middle-aged; and villagers, compared to urbanites, had a more favorable trend based on relevant protocols ( $P < 0.001$ ). Additionally, 4.9% and 29% of deaths due to cardiovascular diseases in individuals aged >30 and >60 years were attributed to hypertension, respectively.

**Conclusion:** The present research findings supported the considerable contribution of hypertension to hypertension-related mortality in cardiovascular diseases cases in Qom Province. Hypertension is a controllable risk factor; considering limited health resources, it is recommended that educational interventions be planned by health policymakers in the target populations to reduce mortality due to this disease.

### \* Corresponding Author:

Moharram Karami Joushin, PhD.

Address: Department of Health Education and Promotion, School of Health, Qom University of Medical Sciences, Qom, Iran.

Phone: +98 (32) 536602040

E-mail: [karamimoharram@gmail.com](mailto:karamimoharram@gmail.com)

## 1. Introduction

**H**ypertension is a common but asymptomatic complication; it is easily identifiable and treatable. If left untreated, 50% of patients with hypertension will die from coronary artery disease or heart failure; approximately 33% from stroke, and about 10%-15% from kidney failure. However, with proper treatment of hypertension, these complications can be prevented [1]. Hypertension is the major risk factor for cardiovascular stroke and affects one in 4 adults [2]. The World Health Organization estimates that at least one billion individuals worldwide have hypertension, and approximately 7.1 million subjects die from the disease, annually [3]. About 73% of deaths in 2015 were due to non-communicable diseases; of which, 48% were due to cardiovascular diseases [4]. In 2010, in Iran, about 92000 deaths were related to heart attacks and strokes, which accounted for 39% of all deaths [5, 6]. Hypertension is a major health problem in developed and developing countries. This is because of its high prevalence in the population and its association with cardiovascular stroke and chronic renal diseases. In industrialized countries, 25% of adults and 60% of individuals aged over 60 years encounter hypertension [7]. Approximately two-thirds of strokes and half of all ischemic heart disease are attributed to systolic blood pressure above 115 mm Hg [8]. Due to the increasing trend of hypertension in Iran, its high prevalence, and its modifiability as a risk factor for cardiovascular disease, it is essential to identify the prevalence pattern of hypertension. Therefore, this study explored the prevalence of hypertension and the attributable contribution of mortality due to cardiovascular diseases associated with hypertension.

## 2. Materials and Methods

The present cross-sectional study examined about 15% of the population aged >30 years, including 72836 middle-aged and elderly referring to the comprehensive healthcare service centers for treating hypertension in Qom Province, Iran, from 2017 to 2019. Considering that information related to blood pressure measurement in the SIB system (integrated health system) and the electronic health record of individuals is recorded in healthcare centers and databases, the required data were collected per the instructions of the care package of the Ministry of Health and Medical Education under the title of IraPen (Package of Essential Noncommunicable Disease Iran) Care Program [9]. To increase the accuracy and validity of the study, the process of correct implementation

according to the IraPen protocol was periodically monitored by the experts of the healthcare center. This study considered the following ranges: healthy blood pressure: (>120/80), pre-hypertension (120/80-139/89), and hypertension ( $\geq 140/90$ ). Moreover, to determine the fraction attributable to the population (PAF), i.e., a proportion of the incidence of the disease in the population and is attributed to a risk factor, the relation  $PAF = P * [(1 - RR_{adj}) / RR_{adj}]$  was used; the prevalence of P and  $RR_{adj}$  is the relative risk of hypertension in the incidence of cardiovascular disease mortality, i.e., indirectly achievable due to the study type, of similar study results based on hazard ratio, i.e., a more accurate relative risk estimate. In the cited studies, the predominant effects of influential variables (other than hypertension) on mortality due to cardiovascular diseases, including age, gender, diabetes, smoking, and moderate obesity, have been reported [10-12]. In this study, Excel and SPSS v. 16 were used to classify, describe, and analyze the obtained data.

## 3. Results

Tables 1 and 2 present the frequency of hypertension in the examined population aged over 30 years by age, gender, and place of residence, as well as fraction attributed to hypertension in the mortality of middle-aged and elderly population in Qom Province. Furthermore, Figures 1 and 2 illustrate systolic blood pressure distribution and diastolic blood pressure in the explored sample during the study period.

## 4. Discussion

The current study results indicated that 62.6% (95%CI: 62.1-63.1) of the examined clients presented healthy blood pressure, 21.2% (95%CI: 19.4-22) pre-hypertension, and 16.2% (95%CI: 15.9-16.4) presented hypertension. Besides, 29% of the total mortality due to cardiovascular diseases occurred in the elderly and 4% in the middle-aged groups due to hypertension. In this study, controlling hypertension decreased in middle-aged patients, compared to elderly patients as well as in men, compared to women ( $P < 0.001$ ). Additionally, 74% of the study patients with hypertension in urban areas, compared to 84% in rural areas presented controlled blood pressure; this difference was significant in the mentioned groups ( $P < 0.001$ ). In this study, the prevalence of hypertension in the group aged over 30 years was determined to be 16.2%. These results were consistent with those of the review study by Mohsenzadeh et al. in Iran and Eghbali et al. in Isfahan; however, they were inconsistent with the results of the Golestan Cohort study [13-15]. In the review study by Afsargharehbagh et al. in 2018,

**Table 1.** The frequency distribution of blood pressure in the population aged over 30 years

Age Group	Study Population	No. (%)			P
		Healthy Blood Pressure <120/80	Pre-Hypertension 120/80-139/89	Hypertension ≥140/90	
Middle-aged (30-59 years)	Male	12988 (63)	5581 (27)	1961 (10)	<0.001
	Female	28865 (75)	5807 (28)	4091 (20)	
	Urban	21470 (70)	5863 (19)	3296 (11)	
	Rural	6399 (66)	2283 (24)	981 (10)	<0.001
	Suburbs	13984 (74)	3242 (17)	1775 (9)	
	Total elderly	41853 (71)	11388 (19)	6052 (10)	
Elderly (≥60 years)	Male	1602 (28)	1996 (35)	2112 (37)	<0.001
	Female	2186 (28)	2045 (26)	3602 (46)	
	Urban	1587 (27)	1795 (30)	2555 (43)	
	Rural	1242 (28)	1353 (30)	1891 (42)	<0.001
	Suburbs	595 (31)	893 (29)	1268 (41)	
	Total elderly	3788 (28)	4041 (30)	5714 (42)	
>30 years	Total study population	45641 (63)	15429 (21)	11766 (16)	9327 (79)

\*The frequency in the subgroups is rounded to the closes digit.

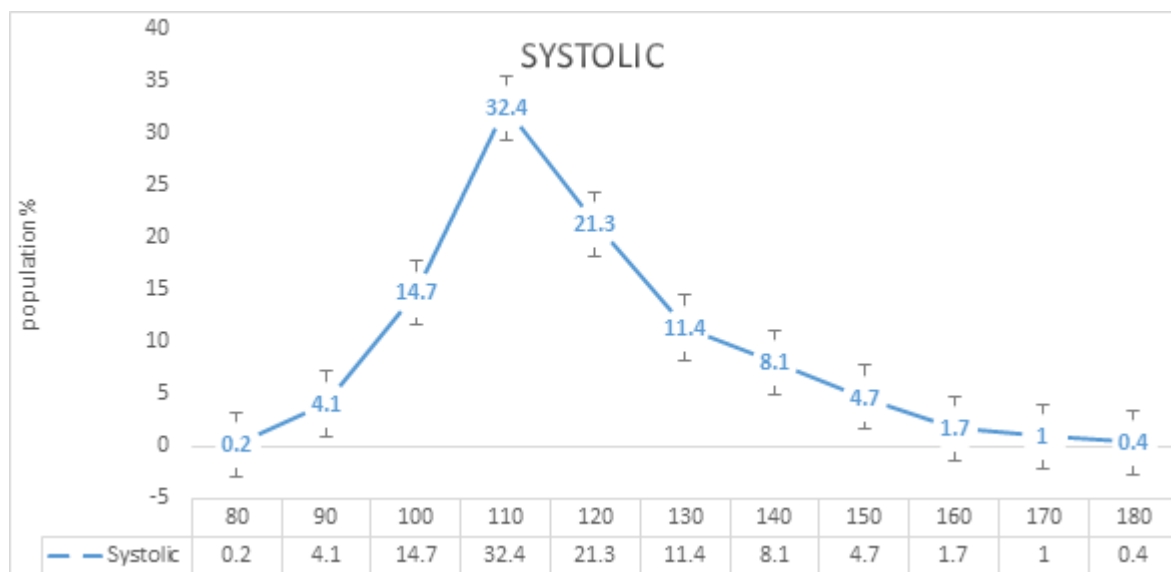
the prevalence of hypertension in Iran was reported to be 20.4% [16]. In a meta-analysis in 2019, Jafari Oori et al. reported the prevalence of hypertension in Iran as 25% of the total population and 42% of the elderly population. This finding was in line with those of the current research concerning the elderly; however, this condition has a low prevalence in the general population [17]. In

the national study of risk factors for non-communicable diseases in Iran, in 2011, the prevalence of hypertension was reported to be 25% [18]. In this study, the Mean±SD values of systolic blood pressure and diastolic blood pressure were 118±22 mm Hg and 74±13 mm Hg, respectively. In the national survey of non-communicable disease risk factors in 2011 by Esteghamati et al., the

**Table 2.** The attributive fraction of hypertension in the attenuation of the studied middle-aged and elderly population

Age Group	Hypertension Prevalence (%)	Damping Caused by	Hypertension Risk Ratio* (CI)	The Share Attributed to Population (CI) (%)
Middle-aged (30-59 years)	21	Cardiovascular diseases**	1.7 (3-8.0.8)	4.2 (7-0.5)
		All causes	1.62 (2-1.8)	3.9 (6-0.6)
Elderly (≥60 years)	42.2	Cardiovascular diseases	3.2 (6-6.1.4)	29 (35-8.15.6)
		All causes	2.01 (3-3.1.2)	21 (29-7.9)
>30 years	16.2	Cardiovascular diseases	2.1 (3-7.1)	8.5 (6.8-10.8)

\*Hazard ratios were reported for hypertension and its value was adjusted for other risk factors affecting cardiovascular diseases; \*\*Cardiovascular diseases include strokes and heart attacks.



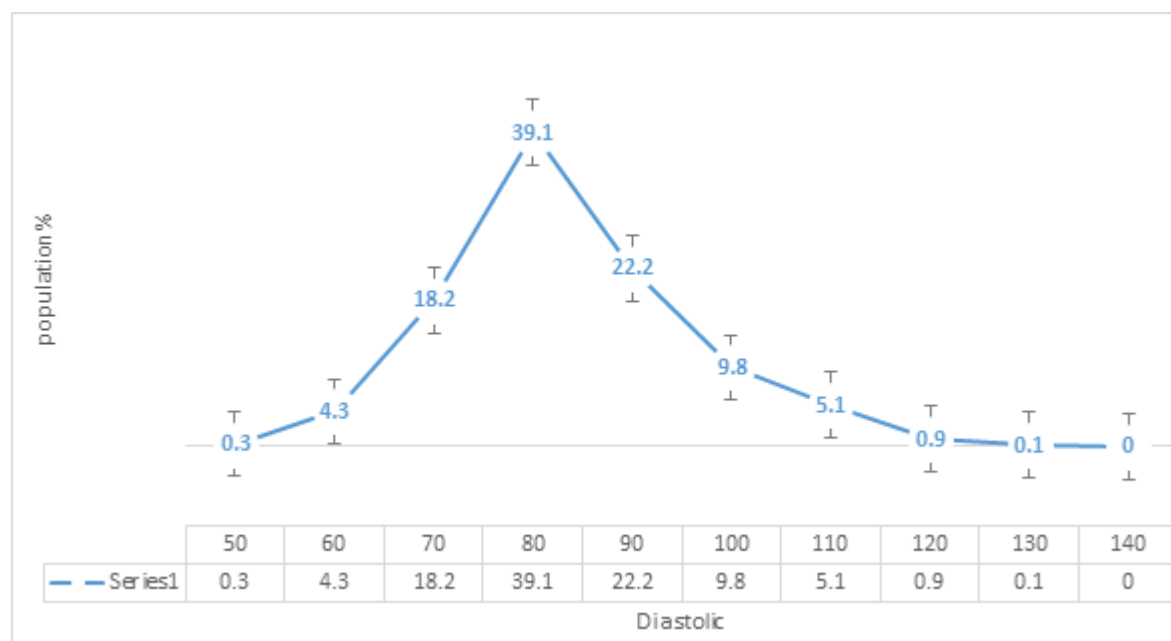
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**Figure 1.** The distribution of systolic blood pressure in the population aged >30 years in Qom Province, Iran, from 2017 to 2019

mean systolic and diastolic blood pressures were measured as 123 mm Hg and 79 mm Hg, respectively, suggesting differences with the present study results [18].

Based on the study of controlled hypertension in Isfahan, Jahrom, Hormozgan, and most recent domestic studies, this rate has been reported as 79%, i.e., higher than that in the current study in Qom Province. This difference could be attributed to increased healthcare, diagnostic, and treatment measures in recent years in Qom Province [15, 19, 20]. In the present study, the control of

hypertension in urban areas was significantly less than that in rural areas; therefore, easy access to healthcare services, proximity and sufficient awareness among the rural population about the existence of free hypertension care services, and the avoidance of urban stressors seem to be influential. In this study, 8.5% and 29% of cardiovascular disease-induced deaths in individuals aged >30 and ≥60 years were attributed to hypertension, respectively. A similar study in Urmia reported a population attributable to hypertension death from ischemic heart disease in the age group of 25-64 years in men as 14.4%



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**Figure 2.** The distribution of diastolic blood pressure in the population aged >30 years in Qom Province, Iran, from 2017 to 2019

and women as 18.6% [21]. A critical reason for the low proportion of the population in this study could be the relatively low prevalence of hypertension, compared to the same study in Urmia.

## 5. Conclusion

The present research findings revealed that the prevalence of hypertension in Qom Province is lower than in the national average. The obtained data supported the attributable share of mortality due to cardiovascular diseases associated with hypertension in Qom Province. Considering that hypertension is a controllable risk factor as well as the limited health resources (financial, manpower), to reduce mortality due to this disease, educational interventions in the target populations should be considered by health policymakers in the province.

## Ethical Considerations

### Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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### Authors' contributions

Conceptualization and supervision: Moharram Karami Joushin and Yadollah Ghafari; Methodology: Hasan Izanloo, Abedin Saghaipour; Investigation, writing and data collection: Siamak Mohebi and Saeed Karimi.

### Conflict of interest

The authors declared no conflicts of interest.

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