

**Prevalence of Hypertension in Algeria:  
Results from a National Survey**

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## **Abstract**

**Objective** To estimate the prevalence of hypertension, its geographic distribution, and awareness, treatment, and control in the general adult population in Algeria.

**Methods** Cross-sectional survey of 1478 nationally representative individuals 18 years of age. Blood pressure was measured by trained observers, and hypertension was defined as  $\geq 140/90$  mm Hg or use of antihypertensive medication.

**Results** Hypertension was identified in 35.3% of the sample. Sex had no significant impact on prevalence, but hypertension risk increased with age (8.9% for those 18-29 years, 72.8% for those  $\geq 70$  years).

Prevalence was significantly higher in blacks (45.8%) than in whites (34.2%) ( $P < 0.01$ ) and in Algiers province (41.5%) than in the rest of the country. Among subjects with hypertension, 48% were aware of their condition; 43% were taking antihypertensive medication and 6% had achieved blood pressure control ( $< 140/90$  mm Hg).

**Conclusion:** Although hypertension is highly prevalent in Algeria, the percentage of affected people who are aware of their disease, receiving treatment, and are under control is unacceptably low. National strategies are urgently needed to improve prevention, detection, and treatment of hypertension in Algeria.

Abstract word count: 181

**Keywords:** blood pressure, awareness and control of hypertension, cross-sectional study, prevalence, Algeria.

## **Introduction**

Approximately 15 to 37% of the world's adults have hypertension, and in some populations high blood pressure affects as many as 50% of individuals older than 60 years. World Health Organization estimates indicate that 600 million people with hypertension are at risk for myocardial infarction, stroke, and cardiac failure. Worldwide, hypertension is responsible for about 13% of all deaths (7.1 million people each year), 62% of strokes, and 49% of myocardial infarctions (American Heart Association, 2005, pp5AB, 6A).

The prevalence and management of hypertension in Western societies and Japan have been extensively described (JNC7, 2003, p2562A; Steckelings, 2004, p80A; Sharma, 2004, p479A; Marques-Vidal, 2004, p25A; Asmar, 2002, p239A; Asai, 2001, p827A), but considerably less information about prevalence is available from developing countries, many of which are witnessing a major change in causes of morbidity and mortality. An ongoing decline in communicable disease is being accompanied by a corresponding surge in noncommunicable chronic illness. By 2020, noncommunicable diseases will account for approximately 80% of the global burden of illness and cause seven of every 10 deaths in the developing world, compared with fewer than half today (Boutayeb, 2005, p1A, 2A).

Cardiovascular disease illustrates this trend in transition from communicable to noncommunicable illness. Decreasing rates in Western countries over the past 30–40 years have been attributed to heightened awareness and control of known risk factors. The burden has shifted to developing countries, where about 80% of cases now occur (Yusuf, 2004, p1A). Cardiovascular disease is the leading cause of death in Argentina, Chile, Cuba, Mauritius, Singapore, Sri Lanka, Trinidad and Tobago, and Uruguay (Antezana, 1996, p1A). This change has been fueled primarily by increases in urbanization, sedentary lifestyles, tobacco use, and consumption of foods high in saturated fats and refined carbohydrates (Yusuf, 2004, p1A). Improvement in life expectancy and the resultant aging of populations have also led to this rise in the prevalence of hypertension (Erdine, 2004, p731A).

In Algeria, another country in transition (Guetta, 1991, p577A), socioeconomic and lifestyle changes have come at the cost of significant increases in heart disease and stroke. As of 2003, Algeria recorded nearly 15,000 deaths due to heart disease and more than 16,000 deaths due to stroke (WHO, 2005, p84A).

Despite the growing importance of cardiovascular disease in Algeria, no national information is available on the prevalence of major cardiovascular or cerebrovascular risk factors. Accordingly, the present national survey was conducted to estimate the prevalence of hypertension, the geographic distribution of affected patients, and the

awareness, treatment, and control of the disease in the general adult population. This effort represents Algeria's first national study on the prevalence of what is becoming an epidemic illness throughout the world. Use of standardized methods to determine prevalence on a countrywide scale permits a comparison of results with those from other nations and will assist in the development of policies to control blood pressure and decrease cardiovascular risk.

## Methods

This cross-sectional survey was designed to evaluate a representative sample of the entire adult Algerian population 18 years of age and older. The cohort was obtained by random cluster sampling carried out in two stages (Table 1) (Rumeau-Rouquette *et al.*, 1993 cited secondarily from SR, p2A). Stage 1 involved creation of a comprehensive list of all the provinces (wilayas) stratified by sanitary (health) region and their classification into five strata (center, east, west, southeast, southwest); the province of Algiers formed a sixth stratum owing to its large population. The sampling unit, the province, was randomly selected from each of these six strata (Rumeau-Rouquette *et al.*, 1993 cited secondarily from SR, p2A), and the number of provinces included was based on the total number within a stratum. Stage 2 of sampling involved random selection from each province of towns or villages. Again their number was determined by the total number of municipalities within a province. Sixty subjects  $\geq 18$  years of age were chosen from each town or village (SR, p2A).

The 1365 subjects required for the survey was estimated by fixing the type 1 error  $\alpha$  at 5% and assuming a 20% prevalence of hypertension in appropriately aged subjects. The result was a selected precision of 3% and a cluster effect of two (Rumeau-Rouquette *et al.*, 1993 cited secondarily from SR, p3B).

The study excluded subjects consuming any substance that might induce secondary hypertension (e.g., long-term corticoid therapy or use of tobacco, coffee, or licorice 30 minutes before blood pressure was recorded, as well as individuals who had not resided in the stratum for more than 5 years (SR, p3C).

Hypertension was defined as a reading of  $\geq 140/90$  mm Hg according to criteria in the seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7, p2561A). Subjects taking a blood pressure–lowering drug were also considered to have hypertension (SR, p3D).

Each subject's blood pressure was measured three times at 1-minute intervals with a validated semiautomatic monitor (OMRON 710 CP, from Omron Algerie SALON Medical Company). The mean of the three recordings was noted. Heart rate was measured 30 seconds after the second blood pressure recording by palpation of the radial pulse. Each subject judged to have hypertension on the basis of the first series of measurements was retested after 7 days (SR, p4A).

Each subject's height, weight, and abdominal circumference were also recorded. A blood sample was taken for assay of total cholesterol, blood glucose, and triglycerides levels (SR, p4A).

EPI-INFO software (version 3 – EPI 6.04 French version edited by Centers for Disease Control and Prevention, ENSP-Epiconcept 2001)\* was used to perform bivariate and multivariate analyses of all data according to a logistic model (SR, p4B).

## **Results**

The study was conducted in February and March 2004. Blood pressure was measured in 1478 subjects, and blood samples were taken from 1461. Table 2 summarizes demographic and clinical information for the study population, which included 572 men (average age 44.2 years) and 906 women (average age 42.7 years) (SR, p4C).

### **Prevalence of hypertension**

Overall, 35.3% (95% confidence interval [CI] 32.0-38.5%) of the entire sample — 32.7% (95% CI 27.3-38.1%) of the men and 36.9% of the women (95% CI 32.7-41.0%) — had hypertension ( $P = NS$  [nonsignificant] for the prevalence difference between sexes) (SR, p5BC). Hypertension was more prevalent among blacks (45.8%; 95% CI 41.2-50.4%) than among whites (34.2%; 95% CI 31.2-37.3 %;  $P < 0.01$ ), and risk increased with age ( $P < 0.001$ ) (Figure 1) (SR, p5CD, p6A). Mean age was 56.0 years (95% CI 54.0-58.0 years) for subjects with hypertension and 36.5 years (95% CI 35.3-37.6 years) for subjects without hypertension (SR, p5C).

Significant regional differences in prevalence emerged ( $P < 0.01$ ). The risks for hypertension were higher for Algiers (41.5%) and the western (40.1%) and southeastern (39.5%) parts of the country, but were lower for the central sanitary region (29.0%) and the eastern region (29.9%) (SR, p12A).

### **Awareness and treatment of hypertension**

Of the subjects with hypertension, 52.0% were unaware of their disease: 65.8% of the men and 44.3% of the women ( $P < 0.001$  for the difference between sexes) (SR, p7A-C).\*

Fully 90% of the 250 survey participants who knew of their hypertension were receiving treatment, but only 13.3% (n=30) of this subgroup (6.1% of the total number with hypertension) had their blood pressure controlled to  $<140/90$  mm Hg (Figure 2) (SR, p7B,9A). Rates of control among the entire hypertensive population with hypertension were 3.2% for men and 7.8% for women. Respective values among subjects under treatment were 7.3% and 15.3% (SR, p9B).

Inadequate blood pressure control among subjects who were aware of their hypertensive state did not appear to result from lack of follow up.

Only 11.2% of these individuals (10.9% of men and 11.3% of women) were not being monitored by either a general practitioner or a specialist (SR, p8B).

Overall, 64.5% of the untreated subjects had isolated systolic hypertension only; 3.2% had only elevated diastolic values; and 32.3% had elevations of both blood pressure components. Table 3 presents the distribution of blood pressure for subjects with untreated hypertension (SR, p6B).

## **Discussion**

This is the first national study of the prevalence of hypertension in Algeria that measured blood pressure in a representative countrywide sample and used accepted techniques, including the most recent and generally accepted definition, and a validated, reliable measurement with classification of subjects based on a total of six recordings (SR, p9C).

Previous evaluations in Algeria have produced highly varied results. Unpublished studies carried out between 1981 and the present yielded rates of hypertension in adults from 7 to 44% (Ben Khedda et al, 2004). In all of the previous surveys indicating low prevalences, however, >160/95 mm Hg was used as the criterion to identify hypertensive individuals (SR, p10A). The recent OASIS 1 trial used the same criteria

for hypertension as the present survey and estimated the prevalence of hypertension in Algeria to be 44% (Temmar, et al, 2003 and 2004) SR, p10A).

The present results generally agree well with those from recent evaluations in other North African countries and elsewhere. A national survey in Morocco indicated hypertension in 33.6% of the sample (30.2% of men, 37.0% of women) (Tazi, 2003, p897A). In the Egyptian National Hypertension Project, a cross-sectional survey of 7915 individuals  $\geq 25$  years of age, 26.3% of the population (26.9% of women, 25.7% of men) had systolic blood pressure (SBP)  $\geq 140$  mm Hg or diastolic blood pressure (DBP)  $\geq 90$  mm Hg. Hypertension was more prevalent among the unemployed (49.7%), the socially isolated (59.7%), individuals with limited education (34.1%), and the obese (body mass index  $> 31$  kg/m<sup>2</sup>; 39.8%). As in the present survey, prevalence in Egypt increased progressively with age, from 7.8% in those 25–34 years old to 56.6% among subjects  $\geq 75$  years (Ibrahim, 1996, pS39A; Ibrahim, 1995, p886A), and awareness and control of hypertension were both low. In Egypt, 37.5% of hypertensive individuals were aware of their high blood pressure; 23.9% were taking antihypertensive medications; and 8.0% had achieved control ( $< 140/90$  mm Hg) (Ibrahim, 1995, p886A). Rates of awareness, treatment, and control tended to be lowest in areas of reduced socioeconomic status (Ibrahim, 1995, p886A). The Algerian results differed in that a high percentage of the cohort surveyed had isolated systolic hypertension (ISH), a relatively rare condition in Egypt.

The percentage of Algerian subjects with SBP  $\geq$ 140 mm Hg was approximately twice that of those with DBP  $\geq$ 90 mm Hg. In the Egyptian survey, the rates of hypertension based on SBP or DBP were approximately equal (Ibrahim, 1995, Table 1A).

Hypertension in North Africa occurs at a rate similar to that in most other parts of the world. A recent summary of prevalence based on a search of the worldwide literature published between 1980 and 2003 indicated crude (ie, not adjusted for age) rates in countries with established market economies (the United States, Canada, Western Europe, Australia, and Japan) that ranged from 22.0% in Canada to 55.3% in Germany. Values for Latin America and the Caribbean region went from a low of 24.7% in Jamaica to a high of 43.5% in Cuba. Hypertension across sub-Saharan Africa affected from 18.5% of the population in Cameroon to 30.2% in Tanzania, and in Asia (excluding Japan) ranged from 17.4% for Hong Kong to 30.5% for Taiwan (Kearney, 2004, pp 11A, 13A).

Awareness and control of hypertension in Algeria were poor. Only 48% of the survey sample with hypertension knew they had high blood pressure, and of the 225 subjects who were both aware and receiving treatment, only 13% had achieved control. This rate was lower than that in most North American and Western European countries but generally similar to rates elsewhere. In the United States, 54.5% of treated individuals with hypertension have their blood pressure controlled,

compared with 47.3% in Canada, 40.3% in the United Kingdom, 29.9% in Germany, and 28.1% in Italy. In Sweden (21.0%) and Spain (18.7%), hypertension control remains even more elusive (Wolf-Maier, 2004, p14A). A systematic review reported control rates of 21.8% in Mexico, 19.8% in Turkey, 28.8% in China, and only 5.4% in Korea (Kearney, 2004, p16A). Much of the variation in successful treatment of hypertension may be attributable to differences in national therapeutic strategies. In any case, more aggressive intervention is necessary wherever treatment and control rates are low (Wolf-Maier, 2004, p16A).

## **Conclusion**

This initial national survey of a representative sample of the Algerian population demonstrated elevated blood pressure in 35.3% of the population, more commonly in women than in men, in blacks than in whites, and in the elderly than in younger individuals. More than one half of the subjects with hypertension were unaware of their disease, and only 6.1% of all individuals with hypertension posted control levels <140/90 mm Hg. Making these figures even more alarming is that the number of people with hypertension, as well as the morbidity and mortality that accompany this disease, is likely to increase as the population ages and becomes more sedentary. As in other countries, hypertension in Algeria has major public health implications that require an urgent national strategy.

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## TABLES AND FIGURES

**Table 1. Results of the sampling plan (SR, p3A)**

Stratum (Sanitary Region)	State 1 Sampling Unit (Provinces)	Stage 2 Sampling Unit (Municipalities)
Algiers	Algiers	Casbah El-Harrach El-Magharria Tessala El-Mardja
Center	Medea	Ksar El-Boukhari Madjebar
	Ain-Defla	Khemis-Miliana El-Attaf
East	Sétif	Setif Harbil Béni-Fouda
	Bejaia	Bejaia Timzrit Beni-Kaila
West	Mascara	Teghenif Matemore
	Ain-Temouchent	Chaabet El-Ham Oued-Sabah
Southeast	Biskra	M'Chounèche El-Hadjeb
	Tamarasset	Ain-M'Guel
Southwest	Bechar	Abadla Ouled-Khoudir
	Adrar	Fenoughil
Total	11	24

**Table 2 Demographic and clinical characteristics of survey population (SR, pp4D, 5A)**

	Number (%)					
	Men		Women*		Total	
Age (y)						
18-29	138	(34.5)	262	(65.5)	400	(27.1)
30-39	115	(39.0)	180	(61.0)	295	(20.0)
40-49	110	(40.6)	161	(59.4)	271	(18.3)
50-59	79	(41.8)	110	(58.2)	189	(12.8)
60-69	75	(45.7)	89	(54.3)	164	(11.1)
≥70	53	(37.1)	90	(62.9)	143	(9.7)
Not recorded	2	(12.5)	14	(87.5)	16	(1.0)
CVD risk factors	-	-	-	-	-	-
Age >55 y for men, >65 yr women	-	-	-	-	-	(18.9)
Family history of early CVD	-	-	-	-	-	(26.3)
Sedentary lifestyle	-	-	-	-	-	(67.5)
Tobacco use	-	-	-	-	-	(12.5)
Body mass index ≥30 kg/m <sup>2</sup>	-	-	-	-	-	(16.5)
Abdominal obesity (abdominal circumference ≥102 cm for men, ≥88 cm for women)	-	-	-	-	-	(36.5)
Diabetes	-	-	-	-	-	(8.9)
Total cholesterol ≥240 mg/dL	-	-	-	-	-	(15.3)

CVD, cardiovascular disease.

\*Because the majority of the individuals present in the households during the interviewers' visits were women, there is a slight predominance of females in the sample.

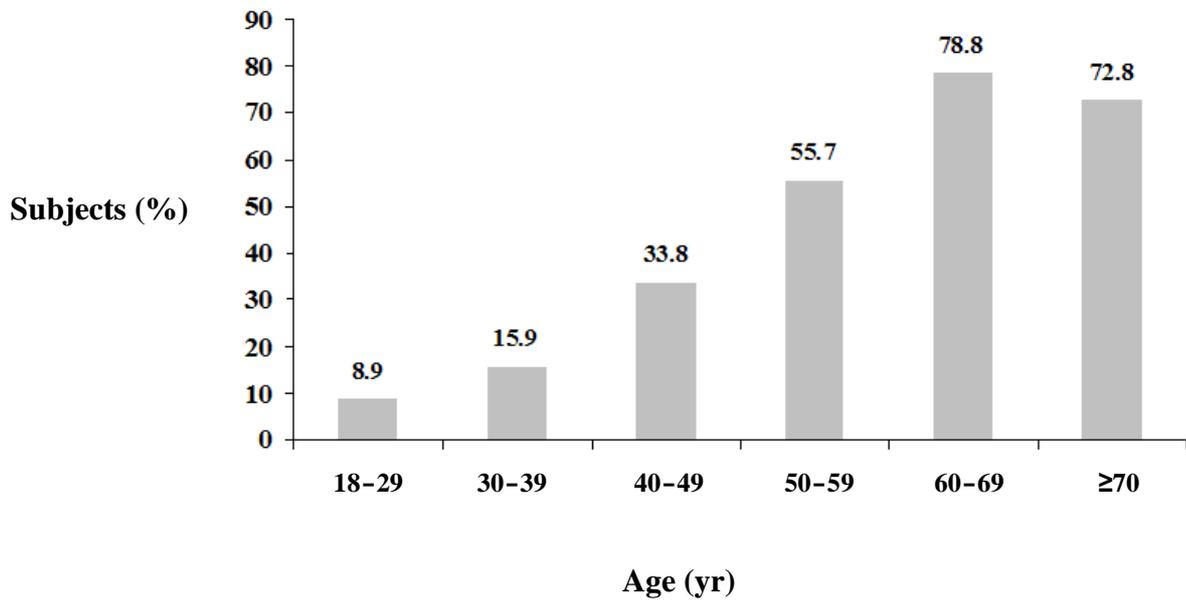
**Table 3      Distribution of blood pressure values for subjects  
(n=296) with untreated hypertension (SR, p7D)**

SBP (mm Hg)	N	(%)	DBP (mm Hg)	N	(%)
<140	34	(11.5)	<90	196	(66.2)
140-60	169	(57.1)	90-100	79	(26.7)
160-180	66	(22.3)	100-110	16	(5.4)
180-200	22	(7.4)	110-120	3	(1.0)
200-220	4	(1.4)	120-130	2	(0.7)
≥220	1	(0.3)	≥130	0	(0)
Total	296	(100)	Total	296	(100)

SBP, systolic blood pressure; DBP, diastolic blood pressure.

**Figure 1** Increased prevalence of hypertension with age

(SR, p5D).



**Figure 2 Awareness, treatment, and control of hypertension**

(SR, p7AB, 9A).

