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(RESEARCH ARTICLE)

The magnitude of high blood pressure and its risk factors in the western region of Algeria

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Abstract

Objectives: The objective of this study was to evaluate the follow-up of hypertensive patients with or without associated cardiovascular risk factors in western Algeria. And to establish a biological and epidemiological profile.

Methods: This is a descriptive cross-sectional study. Two hundred patients aged 40 years and over followed up for the HTA were collected among the population of patients seen in consultation at the hospital of Mascara and Saida (two cities in western Algeria) from November 15, 2017 to February 15. The questionnaire, anthropometric parameters, biological assessments and treatments were noted.

Results: Among the 200 hypertensive subjects recorded, 60% were women and 40% men. The participants had been hypertensive for an average of 10 years. There were more men with diabetes than women: 71.25% vs. 65% for women. About a third of them were type 1 (30% of men and 12.5% of women, p=0.228). Both sexes were almost equally represented, with regard to dyslipidemia: 57.5% of women vs. 60% of men.

Conclusion: High blood pressure is a disease that is progressing rapidly in Algeria. The risk factors associated with hypertension are: Age, BMI, diabetes and dyslipidemia... These data confirm the importance of this pathology in terms of public health.

Keywords: Monitoring; Hypertension; Diabetes; Risk factors

1. Introduction

High blood pressure has been identified as the risk factor with the greatest impact on mortality and disability worldwide [1] The incidence of hypertension is increasing due to the current nutritional transition, sedentary lifestyles, excessive body weight and other modifiable risk factors [2]. According to the American College of Cardiology report, the prevalence of hypertension worldwide has increased from 600 million people in 1980 to 1 billion in 2008 [3]. In Africa, the prevalence of hypertension is highest, reaching 46% of adults [4]. In Morocco, the overall prevalence of hypertension is 33.6% among the population over 20 years of age [5]. In Algeria, like the other Maghreb countries, 35% of the population aged over 18 suffer from hypertension and more than 50% of the patients are unaware that they are hypertensive [6]. Risk factors for increasing the prevalence of hypertension include population growth, ageing and easily modifiable risk behaviors such as poor diet, harmful use of alcohol, smoking, lack of physical activity, overweight/obesity and stress [7], [8]. In the context of an epidemiological transition marked by the increase in chronic diseases and longer life expectancy. The ageing of the population and rapid urbanization are the two levers that are accelerating this pandemic, especially in urban areas [4]. The main objective of this work is to evaluate the monitoring

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of hypertension and its associated cardiovascular risk factors in patients aged 40 years and over in the population of patients seen in hospital consultations.

2. Patients and methods

This descriptive cross-sectional study was carried out in the municipalities of Mascara and Saida (western Algeria) from 15 November 2017 to 15 February 2018.

The recruitment of patients was done at the hospitals of both cities (SAIDA and MASCARA), in accordance with the inclusion criteria.

2.1. Inclusion criteria

Patients aged 40 years and over for both sexes, known hypertensive and treated with the same therapy for at least three months, presence or not of one or more associated cardiovascular risk factors (diabetes or dyslipidemia treated...).

2.2. Non-inclusion criteria

Patients with edemas (regardless of their origin, e.g. in case of oncotic pressure lowering: during cirrhosis, in case of malnutrition in the context of kwashiorkor, in the course of nephritic syndrome due to renal protein loss, dialysis patients), patients with ascites, patients who have undergone surgery within the last 12 months.

A questionnaire containing the main information about the patient (surname, first name, age, sex, weight, height, history, treatment) was administered to each patient.

The weight was measured using an electronic scale (NEC France). The scale was sufficiently large, stable and appropriate for the person to stand on. Regular calibration of the balance was necessary, and the accuracy was ± 50 g. The balance was calibrated regularly. The height was measured in a vertical position, without shoes and heels with a height gauge. The BMI was calculated as the weight (kg) divided by the square of the waist.

The haemogram was performed on the automatic hematology machine "MINDRAY BC-30s". The biochemical examinations were carried out on the automatic biochemistry machine "MINDRAY BS-330". The systolic (PAS) and diastolic (PAD) arterial pressures were measured during the tenth minute in a sitting position using a cuff adapted to the size of the arm "Aneroid Pic Sphygmomanometer". The blood pressure and heart rate values used in this study are based on the average of the three measurements. The study protocol was validated by the local ethics committee. Patient consent was obtained prior to inclusion.

2.3 Statistical analysis

The statistical analysis was carried out on the Epi info version 7 software. The results are presented in absolute values and in percentages for the qualitative variables and by a measure of central tendency and a measure of dispersion for the quantitative variables (the mean when the distributions were normal and the median when the distributions did not follow a normal law). Comparisons between the qualitative variables were made using the chi-square and comparisons between quantitative variables were made using the test of Student. In order to standardize the interpretations of the association measures, we used the prevalence ratio. In cross-sectional studies, the prevalence ratio should be encouraged as it is easier to interpret and more appropriate than the Odds Ratio [9]. The significance threshold is set at P= 0.05.

3. Results

The survey enrolled 200 participants in the communes of Mascara and Saida (western Algeria). With no significant difference between men and women (p= 0.238) the median age of the sample is very close to the average age, (66 ± 9.74), and is 66 years old. The M/F sex ratio is 0.66 in favor of a female majority. The results are presented in Table 1:

Table 1 Characteristics of the study population

	Men (n= 80)	**Women (n= 120)**	**IC 95 %**	**P-Value**
Age (years, mean ± standard deviation)	67.21 ±9.51	65.55 ±9.87	[1.11-4.43]	0.238
BMI (Kg / m2)	26.09 ± 2.96	29.42 ±4.44	[4.44-2.21]	0.0001
Waist/Hip circumference	0.94 ± 0.09	0.96 ±0.03	[0.003-0.007]	0.223
Brachial circumference (cm)	38.40 ±3.78	36.73 ± 4.02	[0.549-2.785]	0.004
Calf circumference (cm)	36.97 ±4.87	39.05 ± 6.86	[3.83-0.333]	0.02
SBP (mm Hg)	138.69 ±19.97	134.86±20.62	[1.97-9.63]	0.194
DBP (mm Hg)	77.64±12.71	75.77±13.25	[1.84-5.58]	0.321
No Diabetics	23 (28.75%)	42 (35%)	[0.007-0.187]	0.062
Diabetics	57 (71.25%)	78 (65%)	[0.223-0.48]	0.362
N	80	120		
Type 2 diabetes	33 (41.25%)	63 (52.5%)	[0.101-0.2]	0.0053
Type 1 diabetes	24 (30%)	15 (12.5%)	[0.007-0.376]	0.228
N	57	78		

About one-quarter of our sample (25.5%) is below the first quartile (58 years), one-quarter is above the third quartile (73 years). Half of the subjects have an age between 58 and 73, corresponding to the interquartile range.

3.1. Anthropometric parameters

The average BMI for men is 26.09 ± 2.96. A BMI higher than 32.92 01 was found in 25% of men. However, only 3.75 % (03 with a BMI = 24.09 below the median BMI (which is equal to the average BMI). The BMI extends over about 14 points between BMI Min = 18.99 and BMI Max = 32.92. The average BMI of women is 29.42± 4.44 higher than that of men. A BMI greater than 32.88 was found in 25% of women. However, only 1.66% of women had a BMI = 29.37 lower than the average BMI. The BMI of women is about 20 points between BMI Min = 19.81 and BMI Max = 39.84. There are four times as many hypertensive women with a BMI greater than 25 compared to hypertensive men. PR = 4.2174, 95% CI = [2.243, 7.929] with a significant difference (p=0.0001). Another anthropometric parameter is used to evaluate the accumulation of fat on the body, and in particular on the abdomen, which can favor cardiovascular diseases. This is the ratio: Waist / Hip circumference. The average Waist / Hip circumference ratio in men is 0.94 ± 0.09, it varies very little (CV= 0.01) but is very sensitive. The Waist / Hip circumference min ratio is 0.10 whereas the Waist / Hip circumference max ratio is 0.98. The average Waist / Hip circumference ratio for women is not significantly different from that of men (p=0.223), it is 0.96 ± 0.03, varying only slightly (CV= 0.03). The Waist / Hip circumference min ratio is 0.91 while the Waist / Hip circumference max ratio is 1.25. Other simple and low-cost anthropometric measures, such as arm or calf circumference, which allow the assessment of muscle mass, could allow easier monitoring of patients. The average BC average and CC average for men are 38.40 and 36.97 cm respectively. A significant difference was noted between the two sexes, concerning these two parameters (BC: p=0.004, CC: p=0.02).

3.2. High blood pressure

The patients in our sample had been hypertensive for an average of 10 years, some had been hypertensive for at least 1 year, while others had been hypertensive for almost 15 years (13 years at Max). Almost half (45%) of them had had high blood pressure for 5 to 10 years. More women had been hypertensive for more than 10 years than men (37.5% of women and 31.25% of men). The risk of developing hypertension earlier in life was higher among women than men: 0.833, 95% CI = [0.559, 1.241]. The mean SBP was 138.69 ±19.97 mm Hg for men and 134.86±20.62 mm Hg for women The mean DBP was 77.64±12.71 mm Hg for men and 75.77±13.25 mm Hg for women, with a homogeneous distribution

within the sample (CV.SBP = 0.14, CV.DBP = 0.17) and no significant difference (p=0.194 for SBP, p=0.321 for DBP). Furthermore, it seems that the changes in SBP were significantly related to DBP (p=0.0001) and that neither of the two values seems to change positively or negatively in isolation.

3.3. Diabetes

67.5% of hypertensive patients were also diabetic, only a third of them were hypertensive without diabetes. The prevalence of diabetes was almost the same for both sexes PR = 1.33, 95% CI = [0.7233, 2.4620], 71.25 for men % vs. 65% for women (p=0.362) Among the hypertensive diabetic patients in our sample, about one third were type 1 (30% in men and 12.5% in women, p=0.228).

Table 2 Patients' biological assessment

Variables	Men M ± SD	Women M ± SD	IC à 95 %	P-Value
Blood glucose (g/l)	1.47 ± 0.71	1.46 ± 0.70	[0.197-0.206]	0.967
Urea (g/l)	0.43 ± 0.20	0.39 ± 0.23	[0.022-0.101]	0.211
Creatinemia (mg/l)	12.47 ± 7.91	11.24 ± 4.73	[0.723-3.178]	0.215
Total cholesterol (g/l)	1.75 ± 0.50	1.71 ± 0.50	[0.104-0.182]	0.589
LDL cholesterol (g/l)	1.07 ± 0.41	1.05 ± 0.38	[0.088-0.141]	0.645
HDL cholesterol (g/l)	0.47 ± 0.16	0.45 ± 0.17	[0.027-0.068]	0.391
TG (g/l)	1.17 ± 0.67	1.22 ± 0.52	[0.134-0.219]	0.633

3.4. Lipid Balance

The mean total cholesterol value was 1.75 ± 0.50 for men and 1.71 ± 0.50 for women, with no significant difference p= 0.589. A close analysis of the different cholesterol fractions shows that the percentage of men with HDL - Low Cholesterol (below 0.40) is much lower than that of women, the values being 30% and 43.33% respectively. While the average values are 0.47 ± 0.16 g/l for men and 0.45 ± 0.17 g/l for women without any significant difference (p=0.391). As far as LDL cholesterol is concerned, a level above 1.60 g/l also represents a cardiovascular risk factor, men and women were found to have similar percentages (15% and 14%). The mean values were 1.07 ± 0.41 g/l and 1.05 ± 0.38 g/l for men and women respectively, showing no significant difference (p= 0.645). Finally, about 68.5 % have a TG rate of less than 1.50 g/l. This trend is confirmed by the average TG rate value of our sample which is 1.2470 ± 0.5876 and a very high variability of the distribution (C.V = 47.12 %). Of the remaining 31.5 %, 20.5 % have TG rates between 1.5 g/l and 2 g/l, and only 11 % have a rate higher than 2 g/l. These percentages, which refer to the entire sample, show that men and women are equally high in terms of triglyceride elevation. The average values are 1.17 ± 0.67 g/l for men and 1.22 ± 0.52 g/l for women, with no significant difference (p= 0.633). Both sexes were almost equally represented in terms of dyslipidemia: The prevalence of dyslipidemia was the same for both sexes (57.5% for women vs. 60% for men). PR = 1.108, IC95% = [0.6236, 1.9711].

3.5. Renal assessment

The average value of urea in our sample is: 0.40 ± 0.22, it varies between a minimum of: 0.22 g/l and a maximum of : 1.41 g/l. It varies little between the different profiles of hypertensive patients (p= 0.211). For men, the average value is 0.43 ± 0.20 g/l, for women it is 0.39 ± 0.23 g/l. The value of 0.25 g/l was the most common (in 15% of hypertensive patients). The average creatinemia of our population is : 11,735 ± 6,2. It varies between a minimum of 3.8 mg/l and a maximum of 62.5 mg/l, which represents an extreme value, with little significance on the distribution of our sample (p= 0.215). 12.47 ± 7.91 mg/l for men and 11.24 ± 4.73 for women. The modal value is 12 mg/l present in 11% of hypertensive patients. Among the patients, 5%). are known as renal insufficiency.

3.6. Treatment of high blood pressure

Although 27.5% of men were treated with antihypertensive monotherapy and 30.83% of women were on fixed combination therapy, there were no significant differences between the different therapies used (Table 3). All classes and combinations of antihypertensive drugs were represented.

Table 3 Treatment of hypertension

Variables	Men	Women	IC 95	P-value
Monotherapy	22 (27.5%)	26 (21.67%)	[11.98-13.31]	0.909
Fixed Bitherapy	20 (25 %)	37 (30.83%)	[12.79-18.45]	0.695
Free Bitherapy	12 (15%)	16 (13.33%)	[6.76-8.09]	0.845
Tri therapy	21 (26 %)	31 (25.83%)	[12.24-15.57]	0.795
Quadri therapy	5 (6.5%)	9 (7.50%)	[3.16-4.49]	0.706
Penta therapy	0	1 (0.83%)		
N	80	120		

4. Discussion

As part of the epidemiological transition in North Africa,), an international, multicenter and cross-sectional study carried out in Algeria, Tunisia and Morocco, showed a total prevalence of hypertension was 45.4% [10]

The prospective and observational cross-sectional study of patients with hypertension reveals interesting epidemiological and clinical clues:

The risk factors determined in this study were consistent with those reported in the literature. Compared to many studies, hypertension was associated with: Blood pressure figures (SBP, DBP), age, BMI, diabetes, dyslipidemia.

The average age in our sample was 66.215 years. Recent data on hypertension indicate that 70% of older people have hypertension, compared to only 32% of adults aged 40 to 59 [11]. Another study (FLASH) confirms that the frequency increases with age, from 40% for those under 55 to 70% for subjects over 75 years [12]. Also, according to the TAHINA survey in Algeria, the frequency of hypertension increases significantly with age, going from 2.81% in subjects aged 35 to 39 to 33.56% in subjects aged 65 to 70 [13].

In our study, women are predominant with a percentage of 60%. Studies have suggested that the prevalence of hypertension is higher in women [14]. This difference was also reported in the cross-sectional survey of the SFMG [15] and the TAHINA study [13]. Women are more inclined to have hypertension than men [16, 17]. According to a study by the French Committee for the Fight against Arterial Hypertension, 22% of women, or 6 million of them, are treated for high blood pressure [18]

In our study, the risk of developing hypertension rather later in life was higher in women than in men PR: 0.833, 95% CI = [0.559, 1.241]. The mean SBP was 138.69 ± 19.97 mm Hg for men and 134.86 ± 20.62 mm Hg for women The mean DBP was 77.64 ± 12.71 mm Hg for men and 75.77 ± 13.25 mm Hg for women, with a homogeneous distribution within the sample (CV.SBP = 0.14, CV.DBP = 0.17) and no significant difference (p = 0.194 for SBP, p = 0.321 for DBP). Since 2018, the ACC / AHA [19] has recommended values below 130/80 mmHg as a therapeutic target for all hypertensive patients. This recommendation is classified in class I and therefore mandatory, for patients at high cardiovascular risk (proven cardiovascular disease or risk of a predicted cardiovascular event greater than 10% at 10 years) and reasonable (class II b recommendation) for those at low risk. The results of the SPRINT trial [20], demonstrating a net benefit in patients randomized to a lower BP target, were of great influence.

In this study, the mean BMI was noted to be 26.09 ± 2.96 in men and 29.42 ± 4.44 in women. KAZADI has found that an obese subject has a 4.2 times probability of developing hypertension than a non-obese subject [21]. A significant association was also observed for BMI even after adjusting for other covariates, suggesting that overweight and obesity per se may lead to the development of hypertension and play a central role in its pathogenesis [22]. The Longevity Check-Up 7+ study reported that body mass index is strongly associated with hypertension [23]

In our series, 67.5% of hypertensive patients were also diabetic, emphasizing the importance of screening for hypertension once diabetes was diagnosed and vice versa. Versa. This result was close to that of the PROCAM study which estimated the prevalence of hypertension (SBP> 160mmhg) in diabetics at more than 50% [24]. In the UKPDS study, 39% of type 2 diabetics had hypertension (SBP> 160 / 90mmHg) [25]. Recently, numerous studies have also

indicated that diabetes has emerged as a surprisingly common correlate with hypertension [26], [27]. On the other hand, epidemiological studies have shown a strong correlation between serum lipid levels and the risk of atherosclerotic cardiovascular disease. Dyslipidemias are common in patients with hypertension [28]. It was also noted that 58.5% of patients present with dyslipidemia. 20.83% of women and 27.5% of men have a total cholesterol level greater than 2g / L, thus 43.33% of women and 30% of men have an HDL-cholesterol level below 0.4g / L. High blood levels of total cholesterol and low of HDL cholesterol are thought to be associated with a significant increase in the risk of arterial hypertension [29]. Dyslipidemia associated with hypertension increases the risk of coronary heart disease [30]. Finally, around 27.5% of patients were on fixed dual therapy and (25%) on open dual therapy.

In the current version of the US and European guidelines, combination therapy has become the preferred option for initiating treatment for the majority of patients. In the ACC / AHA guidelines [19], this is the recommended option for patients with stage 2 hypertension (values greater than 140/90 mmHg). In the ESC / ESH recommendations [31], this is the preferred option for most patients, excluding frail and elderly patients, or those with grade 1 hypertension and low cardiovascular risk.

5. Recommendations

To improve the monitoring of arterial hypertension, one of the avenues would be to set up regular consultations apart from those dedicated to screening, to increase awareness campaigns on the topic of cardiovascular risk and to insist on the training of the various actors working with of the hypertensive person in order to develop a "hypertension monitoring network". A network that involves doctors, pharmacists, and patients.

6. Abbreviations

ARA II: Angiotensin II receptor antagonist; CVA: Cerebrovascular accident; BB: Beta-blocker C.V: Coefficient of variation; BC: Brachial circumference; CC: Calf circumference; HDL: High Density lipoprotein; BMI: Body Mass Index; LDL: Low Density lipoprotein; DBP: Diastolic blood pressure; SBP: Systolic blood pressure; PR: Prevalence ratio;TG: Triglycerides; HC: Hip circumference; WC: Waist circumference; WHO-ISH: World Health organization-international society of hypertension

7. Conclusion

Hypertensive subjects do not constitute a homogeneous group of patients. In the population of this region, the risk factors associated with hypertension are: Age, BMI, diabetes, dyslipidemia. The survey shows that the cardiovascular risk is much greater in hypertensive patients; the latter is probably sometimes underestimated. Recognizing the trajectory of hypertension, in particular through continuous monitoring, is essential in order to choose the best therapeutic objectives.

Compliance with ethical standards

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Disclosure of conflict of interest

No direct or indirect interest (of a financial or other nature) with a private, industrial or commercial organization relationship with the subject presented.

Statement of informed consent

The study was approved by the local medical and health research ethics committee. All participants provided written informed consent, in accordance with the principles of the Declaration of Helsinki.

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