

National Registry of Hypertension. Awareness, Treatment and Control of Hypertension. The RENATA Study

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SUMMARY

Background

Hypertension (HT) is one of the main risk factors for cardiovascular disease. The prevalence of HT has increased due to greater life expectancy and prevalence of obesity in the population. The RENATA study (REgistro NAcional de hiperTensión Arterial, National registry of hypertension) was designed due to the lack of updated epidemiological information in our country.

Objective

To update the prevalence, awareness, treatment and control of HT in Argentina.

Material and Methods

We conducted a cross-sectional study based on surveys performed on subjects randomly selected from seven cities of the country. Blood pressure (BP) was measured on three occasions using an automated sphygmomanometer; the average of the second and third measurements was considered for the analysis.

Results

A total of 4006 subjects (average age 43.7 years) were surveyed. The prevalence of HT was 33.5% (95% CI: 31.9-34.9%) and was greater in men compared to women (41.7% vs. 25.7%; $p < 0.001$). The prevalence increased with age from 11.1% in subjects < 35 years to 68.5% in ≥ 65 years. Among respondents, 37.2% were not aware of their condition (men 44.66% vs. women 25.9%; $p < 0.001$). 56.2% of subjects with HT were receiving therapy, yet HT was well controlled in only 26.5% of them (men 19.8% vs. women 36.8%; $p < 0.001$).

Conclusions

The RENATA study updated the information about the prevalence, awareness and treatment of HT in seven cities in Argentina. Thirty three percent of the population evaluated has HT and this condition is more common in men. The high percentage of patients unaware of having HT and of patients with uncontrolled HT despite of treatment emphasizes the importance of this Registry and reinforces the need of designing specific strategies contributing to improve high BP control in our country.

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Key words > Acute Coronary Syndrome - Myocardial Infarction - Ventricular Function - Troponin

Abbreviations >			
CCCB	Calcium channel blocker	ACEI	Angiotensin-converting enzyme inhibitor
ARB	Angiotensin II receptor blocker	BP	Blood pressure
BB	Beta blocker	DBP	Diastolic blood pressure
HT	Hypertension	SBP	Systolic blood pressure

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BACKGROUND

Cardiovascular disease is the leading cause of death in our country. Hypertension (HT) is one of the main risk factors for coronary artery disease, stroke, heart failure and kidney failure. (1-3)

Hypertension control reduces the incidence of stroke, myocardial infarction and heart failure by 40%, 25%, 50%, respectively. (4)

Previous epidemiological studies performed in our country, as the FRICAS study (Factores de Riesgo Coronario en América del Sur, Coronary Risk Factors in South America) demonstrated that HT doubles and triples the risk of myocardial infarction in men and in women, respectively. (5)

The REDIFA study (Relevamiento de los Distritos de la Sociedad Argentina de Cardiología de los factores de riesgo coronario, Survey of the Districts of the Argentine Society of Cardiology in Cardiovascular Risk Factors) reported a prevalence of HT of 25%. This study demonstrated that 11% of the population never had their blood pressure (BP) measured and that the lack of medical coverage and education, and unemployment were associated with the absence of adherence to antihypertensive treatment. (6)

The First National Survey of Risk Factors determined that 78.7% of the population had their blood pressure measured over the last two years. Among these subjects, 34.7% had high BP levels at least once. This survey used self-reported HT as diagnosis of the condition, yet it did not evaluate the degree of awareness of the disease or BP control with treatment. (7)

Other studies developed in our country and other nations demonstrated that BP control is achieved in a low percentage of hypertensive patients. (8-15, 19, 20) Health surveys focused on the prevalence and awareness of HT in the population have demonstrated a favorable influence in HT control.

In the United States, the successive NHANES (National Health and Nutrition Examination Survey) reports show how education and prevention campaigns have increased the proportion of hypertensive patients who are aware of their condition and improved the number of patients treated and controlled over 35 years. Between 1976 and 2000 the percentage of patients who were aware of their condition increased from 51% to 69%, the percentage of patients treated increased from 31% to 58% and, finally, HT control improved from 10% to 31% between 1988-2000 (8, 9) and to 50% between 2007-2008. (10)

Similar studies performed in the United Kingdom reported that awareness, treatment, and control of hypertension increased between 2003 and 2006. (11)

Several epidemiological studies were performed in different cities of our country (12-16) during the nineties. The city of Buenos Aires participated in the CARMELA study in the period 2003-2005. (17, 18) The lack of subsequent registries does not allow us to evaluate further improvement in the degree

of awareness, treatment and control of HT in our country.

For this reason, the Argentine Council on Hypertension, with the cooperation of the Argentine Society of Cardiology and few Regional Districts of the Argentine Society of Cardiology designed the RENATA study (REGistro NAcional de HiperTensión Arterial, National Registry of Hypertension). The goals of this study were:

1. To make an update of the prevalence of HT in different cities from our country.
2. To evaluate the percentage of patients aware of their condition.
3. To evaluate the percentage of patients with HT treated with antihypertensive agents.
4. To evaluate the percentage of hypertensive patients controlled with treatment.

MATERIAL AND METHODS

The RENATA study was developed in two stages. The first stage was performed in the Autonomous City of Buenos Aires from October to December 2008, and the second stage was carried on in inland cities of our country from October to December 2009.

We conducted a cross-sectional survey. The protocol design and the survey were evaluated and approved by the Committee on Ethics of the Argentine Society of Cardiology.

A non-probability and randomized sample of subjects > 18 years were included. Subjects were divided by gender and into 5-year age groups derived from the last 2001 National Census of the general population (< 34, 35-44, 45-54, 55-64 and > 65 years). The sample was completed in seven representing six regions from our country: the Autonomous City of Buenos Aires (Autonomous City of Buenos Aires and province of Buenos Aires), Córdoba (Central region), San Miguel de Tucumán (Northwest), Corrientes and Resistencia (Northeast), Mendoza (Cuyo) and Neuquén (Patagonia). In all the cases the surveys were conducted at the Documentation Department of the Argentine Federal Police (PFA). The participants were randomized at the waiting room by a surveyor. Those sitting on the left side of the room and who had identity cards with a final digit ending in an even number were invited to participate in the survey.

The respondents signed an informed consent form and demographic information was obtained in a calm environment. Then they were asked if they had hypertension and if so, which type and number of antihypertensive drugs they were taking. They also had to respond about smoking habits, level of education and medical coverage.

Blood pressure was measured with the subject in the sitting position, following the recommendations of the Consensus on Hypertension of the Argentine Society of Cardiology. (21) Measurements were performed on three occasions separated by intervals of one to two minutes using an automated sphygmomanometer Omron HEM 705 CP. All the records were printed. Blood pressure was defined as the average of the second and third measurements.

The survey was completed and BP was measured by previously trained cardiology technicians and nurses from the Argentine Society of Cardiology.

Hypertension was defined as systolic blood pressure (SBP) ≥ 140 mm Hg and/or diastolic blood pressure (DBP) ≥ 90 mm Hg or presence of antihypertensive treatment.

Controlled hypertension was considered in subjects under antihypertensive treatment with SBP < 140 mm Hg and DBP < 90 mm Hg.

Statistical Analysis

The sample size was calculated using the Pocock's formula to evaluate the primary outcome, considering an alpha level of 0.001, a confidence interval of 99.9% and a study power of 95%. The number of people needed to survey was 1923.

The Kolmogorov–Smirnov goodness of fit test was used to assess normality of distribution of mean age and blood pressure. Then, these variables were analyzed and compared using t test or ANOVA. The Mann-Whitney test was used to compare variables without a normal distribution. The chi-square test was used to evaluate the possible association among qualitative variables. A p value < 0.05 was considered statistically significant. The association between the prevalence of HT as an independent variable and level of education, medical coverage, age and gender as independent variables was analyzed with a logistic regression model. Statistical analysis was performed using SPSS 11.5 and SAS version 8 statistical packages.

RESULTS

A total of 4150 surveys were carried out; 144 were not considered due to incomplete data. The survey response rate was 80%. The final sample included 1938 men (48.4%) and 2068 women (51.6%); mean age was 43.7 ± 17 years (range: 18-92), divided in five age groups proportional to the general population.

Average BP was significantly higher in men compared to women (132.3/79.4 mm Hg vs. 121.1/74.4

mm Hg, respectively, $p < 0.001$) (Table 1).

Systolic blood pressure increased with age in men and women, yet it was higher in men up to 54 years of age. Diastolic blood pressure presented a mild increase in men up to 54 years of age in men and 64 in women (Table 2).

The prevalence of HT in the general population was 33.5% (95% CI: 31.9% - 34.9%) (Table 3) and was greater in men compared to women (41.7%, 95% CI 39.5-43.9% vs. 25.7%, 95% CI 23.8-27.6%; $p < 0.001$).

The prevalence of HT increased with age in both genders, from 11.1% in subjects < 35 years to 68.5% in ≥ 65 years, and was greater in men compared to women up to 54 years of age (Figure 1).

Among those with hypertension, 37.2% were unaware of their condition (44.6% of men and 25.9% of women), while 6.6% knew they had hypertension but were not receiving treatment (6.9% in men and 6% in women). The percentage of hypertensive subjects aware of their condition and treated with different antihypertensive agents was 5.2%; yet, only 26.5% (95% CI 24.9-27.7%) had their BP well controlled. Blood pressure control was better in women [36.8% (95% CI 34.5 -38.7%)] compared to men [19.8% (95% CI 17.7-21.3%)] ($p = 0.001$) (Figure 2). Younger patients were less likely to be aware of their condition (Figure 3).

Logistic regression analysis did not demonstrate any association between the prevalence of HT and educational level or medical coverage after adjusting

Table 1. Population

	Total	Men (%)	Women (%)	p
n (%)	4006	1938 (48,4)	2068 (51,6)	
Age (years \pm SD)	43.7 \pm 17	43.9 \pm 17	43.5 \pm 16	
BP (mm Hg)	126.5/76.8	132.3/79.4	121.1/74.4	< 0.001
SE	(0.28/0.18)	(0.38/0.27)	(0.38/0.23)	
Current smokers	973 (24.3%)	472 (24.4)	501 (24.2)	ns
Former smokers	709 (17.7%)	448 (23.1)	261 (12.6)	< 0.001
Known diabetics	183 (4.6%)	100 (5.2)	83 (4.0)	ns
Primary Education	707 (17.6%)	353 (18.2)	354 (17.1)	ns
Secondary education	1627 (40.6%)	874 (45.1)	753 (36.4)	ns
Higher/College education	1636 (40.8%)	698 (36.0)	938 (45.4)	ns
Prepaid medical insurance	670 (16.7%)	313 (16.2)	357 (17.3)	ns
Social security coverage	2669 (66.6%)	1308 (67.5)	1359 (65.7)	ns
Public hospital	667 (16.7%)	316 (16.3)	353 (17.1)	ns
	Total	Men (%)	Women (%)	p
Hypertensive patients	1341 (33.5%)	809 (41.7)	532 (25.7)	< 0.001
Unaware of HT	499 (37.2%)	361 (44.6)	138 (25.9)	< 0.001
Aware not treated	88 (6.6%)	56 (6.9)	32 (6.0)	ns
Aware, treated and uncontrolled	398 (29.7%)	232 (28.7)	166 (31.2)	ns
Aware, treated and controlled	356 (26.5%)	160 (19.8)	196 (36.8)	< 0.001

SD: Standard deviation. SE: Standard error. HT: Hypertension

by age and gender (Figure 4).

Among hypertensive subjects under medical treatment, 71.3% were taking one drug, 22.7% two drugs and 6% three drugs or greater. Subjects with hypertension were taking 1.35 drugs per patient, without significant differences among those with controlled vs. uncontrolled BP. There were no significant differences in BP according to the number of drugs used. The following agents were most commonly used: angiotensin-converting enzyme inhibitors (ACEIs) (49.9%), beta blockers (BBs) (29.9%), angiotensin II receptor blockers (ARBs) (22.4%), and calcium channel blockers (CCBs) (15.6%). The use of diuretics was uncommon (12.3%). The most common association was BB + ACEI (34.7%) without significant differences between controlled vs. uncontrolled hypertension.

DISCUSSION

The RENATA study is the first randomized registry of hypertension performed in different regions of Argentina which used a validated automated sphygmomanometer to measure blood pressure on three determinations. The three measurements were recorded and the first one was not considered for the analysis. The advantage of this procedure is that it avoids observer bias, round-off errors and decreases the white coat effect.

This study provides important information: 1) a prevalence of HT of 33.5%, 2) 37.2% of the population were not aware of having HT, 3) 6.6% of subjects knew they had HT but did not receive any treatment, and 4) 56.2% of hypertensive patients were treated but only one out of four had BP well controlled; BP control was greater in women compared to men.

Age	≤ 34	35-44	45-54	55-64	≥ 65	Total
Men, n	718	333	305	286	296	1938
%	37.0%	17.2%	15.7%	14.8%	15.3%	
SBP (mm Hg)	127.7	129	135.1	138.1	139.3	132.3
SE	0.45	0.77	1.09	1.06	1.25	0.38
DBP (mm Hg)	75	80.6	83.9	83	81.2	79.4
SE	0.38	0.6	0.74	0.72	0.7	0.27
Women, n	754	377	362	293	282	2068
%	36.5%	18.2%	17.5%	14.2%	13.6%	
SBP (mm Hg)	112.3	118	123.8	130.6	135.4	121.1
SE	0.39	0.78	0.92	1.04	1.19	0.38
DBP (mm Hg)	70.4	75.3	77.1	78.3	76.2	74.7
SE	0.32	0.59	0.56	0.6	0.65	0.23
Total, n	1472	710	667	579	578	4006
%	36.7%	17.7%	16.7%	14.5%	14.4%	
SBP (mm Hg)	119.8	123.1	129	134.3	137.4	126.5
SE	0.36	0.59	0.74	0.76	0.87	0.28
DBP (mm Hg)	72.7	77.8	80.2	80.6	78.8	76.8
SE	0.25	0.43	0.47	0.48	0.49	0.18
Hypertensive patients (%)	11.1	21.8	42.6	59.1	68.5	33.5

SBP: Systolic blood pressure. DBP: Diastolic blood pressure. SE: Standard error.

Table 2. Blood pressure by gender and age

Table 3. Awareness, treatment and control of hypertension by the different regions

Work groups	CABA	BS. AS.	Central (Córdoba)	Norhtwest (Tucumán)	Northeast (Corrientes and Chaco)	Cuyo (Mendoza)	Patagonia (Neuquén)	Total	p
Number of survey respondents	871	1.052	758	454	386	231	254	4006	
Prevalence of HT (%)	28.1	35.1	37.8	31.2	34.4	37.2	30.7	33.5	
Unaware of HT (%)	35.9	36.2	27.8	47.8	32.3	47.6	62.8*	37.2	< 0.001
Aware not treated (%)	8.1	7.2	5.9	1.4	3.7	4.6	5.1	6.6	
Aware, treated and uncontrolled (%)	30.2	30.2	37.9	21.1	30.1	29.1	20.5	29.7	
Aware, treated and controlled (%)	25.7	26.2	28.2	29.5	33.8	18.6	11.5*	26.5	< 0.001

Fig. 1. Prevalence of hypertension by gender and age.

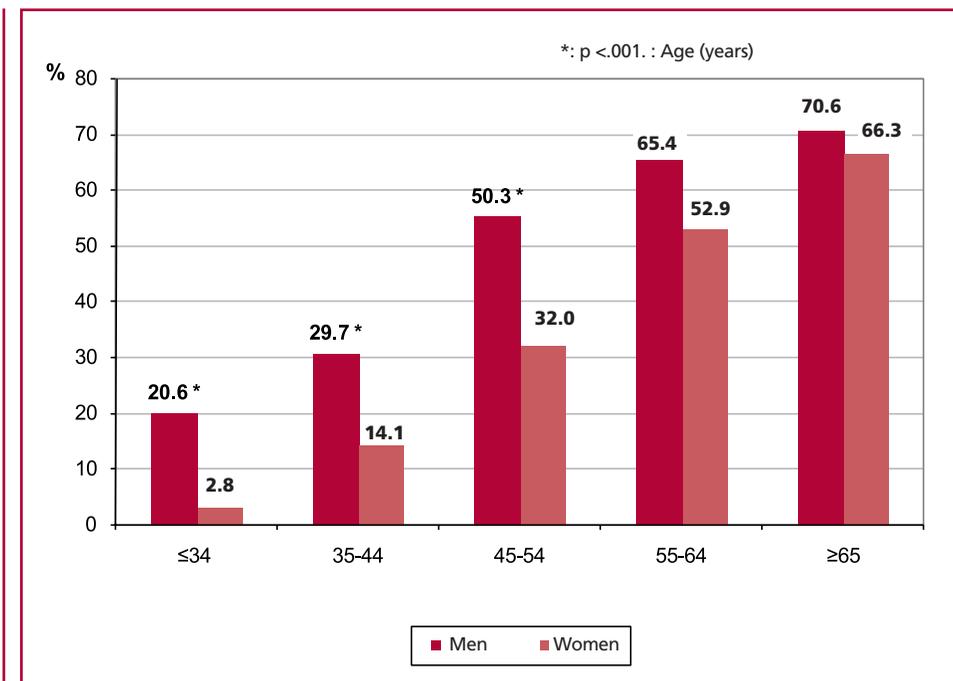


Fig. 2. Awareness, treatment and control of hypertension.

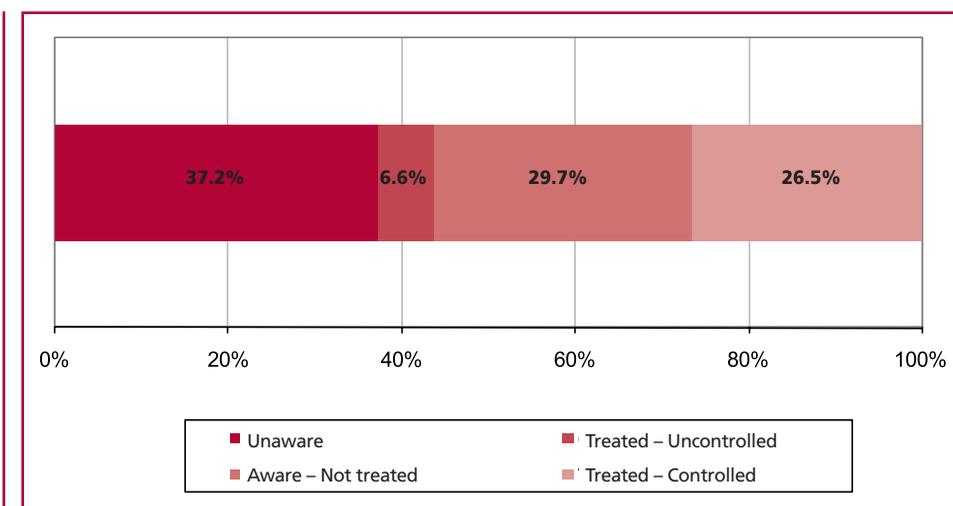
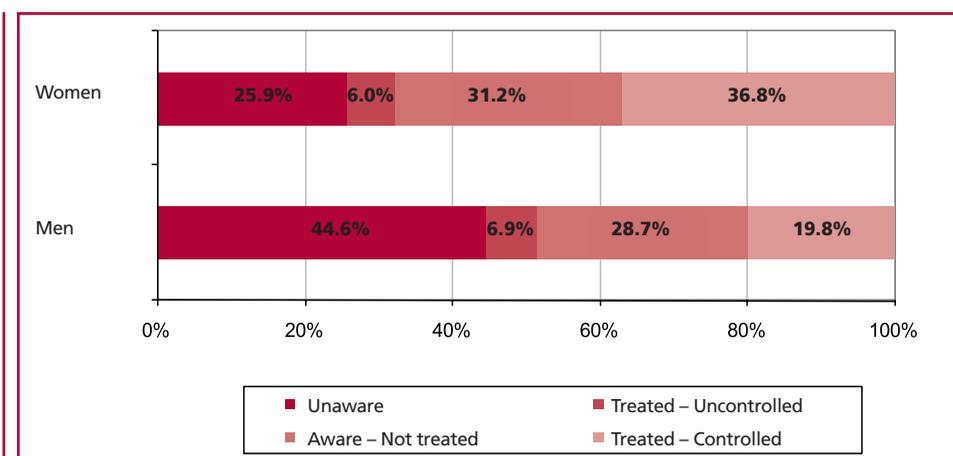


Fig. 3. Awareness, treatment and control of hypertension by gender



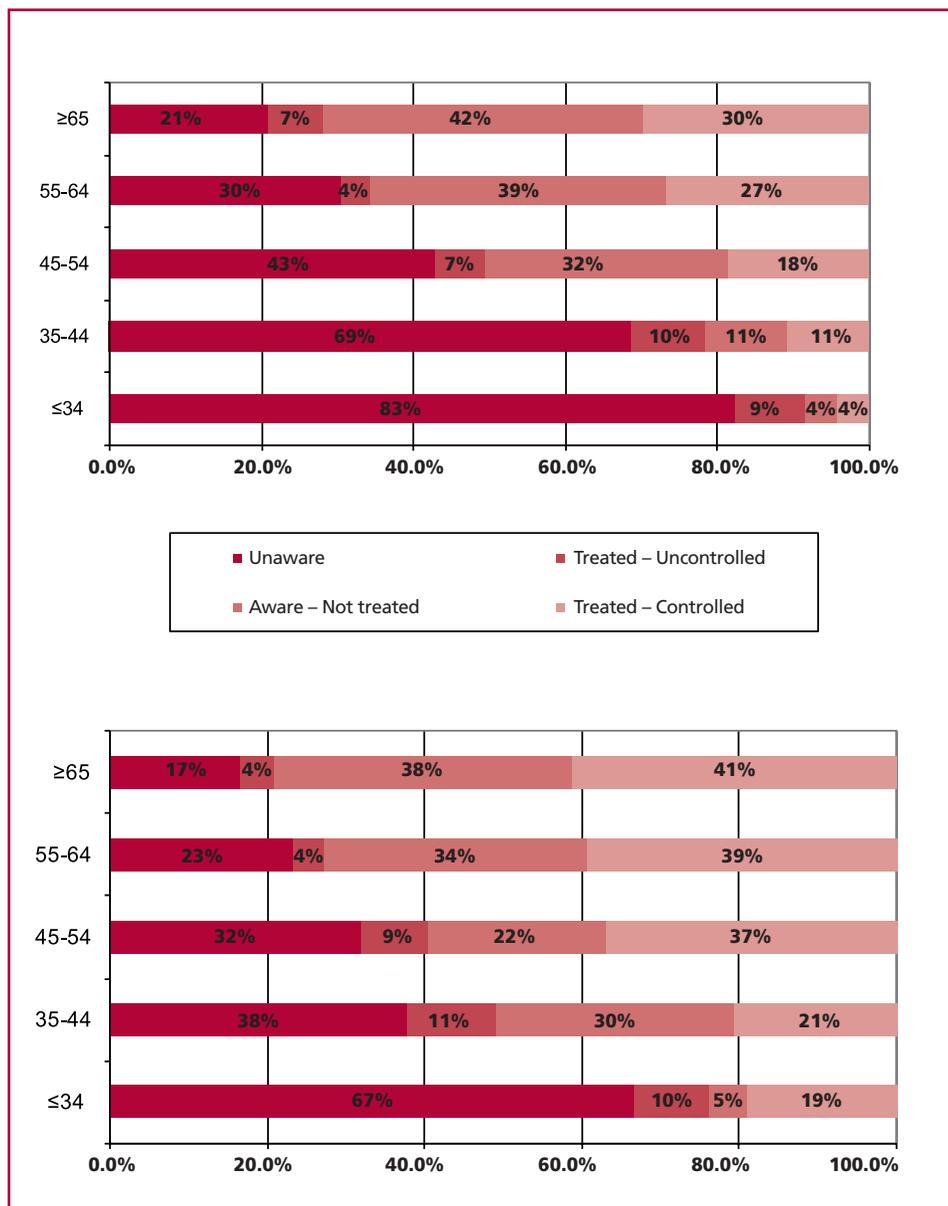


Fig. 4. Awareness, treatment and control of hypertension by gender and age Men.

The BP levels and the prevalence of HT in men and women reported in our study were similar to those published by other registries performed in our country and in others over the past years.

Nowadays, the prevalence of HT in the different cities nationwide is similar to the one reported in previous studies: 32.7% in La Plata in 1985, (12), 31.4% in Rosario in 1995 (15) and 29.9% in Córdoba in 1999. (16) The CARMELA study, a recent epidemiological study, showed a prevalence of HT of 29% (37.7% in men and 21.7% in women) in the Autonomous City of Buenos Aires. (17) The NHANES study, considered as a reference study for developed countries on several occasions, reported a prevalence of HT of 23.9% for the period 1988-1994, 28.5% for the period 1999-2000 and 29% for the period 2007-2008. (10)

A systematic review reported that the prevalence of HT varied around the world, with the lowest

prevalence in rural India (3.4% in men and 6.8% in women) and the highest prevalence in Poland (68.9% in men and 72.5% in women). (19, 20)

This wide variation in the prevalence of HT may be related to the type of survey performed, to self-reported HT, or to the age range of the participants. Other factors include the type of method used to measure BP, using a single BP determination with a non-validated device, round-off errors and special characteristics of the population, among others. In the RENATA study, the fact that BP was measured in a single interview was partially compensated by the method used: BP was considered as the average of the last two of three determinations which were recorded and printed.

The lack of awareness of HT in the study population was lower (37.2%) compared to the one previously published (about 50%). (14, 16)

In our study, the lack of awareness was < 50%, except for the city of Neuquén. The percentage of hypertensive patients without treatment in our study is lower compared to that reported by Nigro et al. in 1999 (6.6% vs. 12%, respectively). (16) This finding suggests a that the diagnosis of HT has improved and that treatment is started earlier in some cities nationwide.

The lack of awareness of the disease was significantly greater in men compared to women (44.6% vs. 25.9%), particularly among younger patients (< 44 years). Probably women are more likely than men to seek medical advice as a consequence of having the habit of preventing gender-related diseases.

More than 50% of hypertensive patients are treated, but only one out of four has BP well controlled. Hypertension control is greater in women than men and in persons > 45 years.

The method used to recruit subjects and to measure BP cannot be compared to the one used in studies performed in the nineties; yet, the results of the RENATA study suggest that HT control rate has improved. According to the CARMELA study, HT control rate was 5% in La Plata in 1985, 13% in Córdoba in 1999 and 18% in the city of Buenos Aires in 2008. In other developed countries, as the United States, the NHANES III reported the HT control increased from 27.3% (1988-1994) to 50% (2007-2008). (10)

In the United Kingdom, Falaschetti et al. demonstrated that HT control were higher in 2006 than in 2003 (from 22% to 28%) and had increased more among women than men: from 23% to 32% in women and from 21% to 24% in men. (11) These results are similar to the differences by gender in HT awareness and control reported by the RENATA study. The fact that younger patients are more unaware of the disease and the lower control rate in young men are important factors to draw our attention in this subgroup of patients. Finally, we found that more than 70% of patients were treated with monotherapy, although this observation was not a primary outcome of the study. Nowadays, most of the publications coincide that about 70% of hypertensive patients need two drugs or greater for BP control. (22-24) The use of monotherapy might have contributed to the HT control rate observed in the RENATA study.

Study Limitations

The sample was recruited in important urban centers of the regions evaluated, thus it may not be extrapolated to rural cities of the same regions.

CONCLUSIONS

The prevalence of HT in the population evaluated was coincidental with the one reported in other places. The high percentage of patients unaware of having HT and of hypertensive patients with uncontrolled HT reinforces the need of designing specific strategies

contributing to improve high BP control.

The RENATA study provides a simple and low-cost method of conducting surveys in different cities of our country. It may be repeated every four or five years with the same limitations with the goal of monitoring the results of the strategies used and establishing an epidemiological surveillance for a better control of one the main risk factors for cardiovascular and cerebrovascular disease.

RESUMEN

Registro Nacional de Hipertensión Arterial. Conocimiento, tratamiento y control de la hipertensión arterial. Estudio RENATA

Introducción

La hipertensión arterial (HTA) es uno de los principales factores de riesgo de enfermedad cardiovascular. Su prevalencia ha aumentado debido a la mayor expectativa de vida y a la mayor prevalencia de obesidad en la población. La escasez de datos epidemiológicos actualizados en nuestro país hizo necesario el diseño del estudio RENATA (REgistro Nacional de hiperTensión Arterial).

Objetivo

Actualizar la prevalencia, el grado de conocimiento, el tratamiento y el control de la HTA en la Argentina.

Material y métodos

Se trata de un estudio transversal basado en encuestas que se realizaron en forma aleatorizada a individuos en siete ciudades del país. La presión arterial (PA) se midió con un tensiómetro automático en tres ocasiones y se consideró para el análisis el promedio de la segunda y la tercera medición.

Resultados

Se encuestaron 4.006 individuos con una edad promedio de 43,7 años. La prevalencia de HTA fue del 33,5% (IC 95%: 31,9-34,9%) y fue mayor en hombres que en mujeres (41,7% vs. 25,7%; $p < 0,001$). La prevalencia aumentó con la edad del 11,1% en < 35 años al 68,5% en ≥ 65 años. El 37,2% desconocía su enfermedad (hombres 44,66% vs. mujeres 25,9%; $p < 0,001$). El 56,2% de los individuos hipertensos estaban tratados pero sólo el 26,5% de ellos se encontraban bien controlados (hombres 19,8% vs. mujeres 36,8%; $p < 0,001$).

Conclusión

El estudio RENATA actualizó los datos de prevalencia, conocimiento y tratamiento de la HTA en siete ciudades de la Argentina. Se observó que un tercio de la población evaluada es hipertensa y que la HTA es más frecuente en hombres. El alto porcentaje de pacientes que no conocían su enfermedad, así como el de hipertensos tratados y no controlados, además de resaltar la importancia del presente Registro, refuerza la necesidad de diseñar estrategias específicas que contribuyan a mejorar el control de esta patología en nuestro país.

Palabras clave > Hipertensión arterial - Prevalencia - Toma de conciencia - Control

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