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ORIGINAL

# Are risk factors and cardiovascular risk scales controlled in hypertensive patients under treatment?

*¿Estan controlados los factores de riesgo y las escalas de riesgo cardiovascular en los pacientes hipertensos en tratamiento?*

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## Summary

**Introduction:** High blood pressure is considered one of the main cardiovascular risk factors; therefore, it is essential to exercise adequate control over it.
**Hypothesis:** The blood pressure control in people undergoing treatment is not very accurate and, in addition, the values of the different scales related to cardiovascular risk are high in this group of treated people.
**Material and methods:** Descriptive cross-sectional study conducted in 34,595 hypertensive patients under treatment for both hypertension and associated comorbidities. We assessed the influence of treatments on the degree of control of arterial hypertension and on the values of different scales related to cardiovascular risk.
**Results:** 49.31% of our total population exhibited normal values of blood pressure normal (59.25% in women and 44.54% in men). Almost all the scales analyzed (overweight and obesity, atherogenic indices, metabolic syndrome, cardiovascular risk scales and fatty liver scales) presented worse values in the group that was receiving treatment for arterial hypertension, for dyslipidemia and for diabetes simultaneously.
**Discussion:** Half of the people who were receiving drug treatment for hypertension show high blood pressure levels, so it is necessary discuss about what strategies are necessary to improve this situation.

*Keywords:* Hypertension, cardiovascular diseases, obesity, dyslipidemia, metabolic syndrome.

## *Resumen*

**Introducción:** La hipertensión arterial se considera uno de los principales factores de riesgo cardiovascular, por lo que es fundamental ejercer un adecuado control sobre ella.
**Hipótesis:** El control de la presión arterial en personas en tratamiento es poco preciso y, además, los valores de las diferentes escalas relacionadas con el riesgo cardiovascular son elevados en este grupo de personas tratadas.
**Material y métodos:** Estudio descriptivo transversal realizado en 34.595 pacientes hipertensos en tratamiento tanto de la hipertensión como de las comorbilidades asociadas. Se evaluó la influencia de los tratamientos en el grado de control de la hipertensión arterial y en los valores de diferentes escalas relacionadas con el riesgo cardiovascular.
**Resultados:** El 49,31% de nuestra población total presentaba valores normales de presión arterial (59,25% en mujeres y 44,54% en hombres). Casi todas las escalas analizadas (sobrepeso y obesidad, índices aterogénicos, síndrome metabólico, escalas de riesgo cardiovascular y escalas de hígado graso) presentaron peores valores en el grupo que recibía tratamiento para la hipertensión arterial, para la dislipidemia y para la diabetes simultáneamente.
**Discusión:** La mitad de las personas que estaban recibiendo tratamiento farmacológico para la hipertensión arterial presentan niveles elevados de presión arterial, por lo que es necesario discutir sobre qué estrategias son necesarias para mejorar esta situación.

*Palabras clave:* Hipertensión, enfermedades cardiovasculares, obesidad, dislipidemia, síndrome metabólico.

## Introduction

Systolic blood pressure is the force exerted by the blood on the arteries when the heart contracts, while the diastolic reflects the pressure in the arteries when the heart rests. It is a remarkable feature that arterial hypertension is a disease that can be controlled, which decreases the quality and life expectancy since it increases the risk of cardiovascular diseases. The modification of the lifestyle and the treatment with specific medication allows controlling the arterial hypertension.

Among the main risk factors, we find age (over 50 years), male gender (although women in post-menopause have increased risk of hypertension), family history, obesity, sedentary lifestyle, alcohol, tobacco, stress, high salt consumption and some contraceptives (especially, in smoking women), among others.

Hypertension treatment is based on drugs and lifestyle changes and low salt diet. It is necessary to avoid the consumption of processed foods, sausages, cold meat, hard cheeses; select low-sodium foods and waters; and encourage the consumption of fruits and vegetables as a source of potassium (which helps control blood pressure). In case of overweight, a reduction in body weight is indicated. Quitting smoking is also recommended. Regular physical activity might be patterned according to the age of each patient, but the recommendation is 30 minutes of daily moderate physical activity.

Currently, antihypertensive are classified according to their mechanism of action as:

- Diuretics. Drugs that reduce the cardiovascular morbidity and mortality associated with HT[1]. There are three different subgroups of diuretics: thiazides, loop of Henle diuretics and potassium sparing agents.
- Beta-blockers. Highly effective, both in monotherapy and in association, in the treatment of mild-to-moderate HT, in the prevention of cardiovascular complications[2], in the clear prevention of reinfarction in patients with ischemic heart disease[3] and in increasing survival in patients with heart failure[4].
- Calcium channel blockers are characterized by a very fast onset of action, which can lead to hypotension in vulnerable individuals, especially the elderly[5]. For this reason, these drugs are currently generally prescribed in extended-release presentations.
- Angiotensin-converting enzyme inhibitors not only reduce blood pressure, but also reduce the vascular damage caused by hypertension (renal failure or heart failure[6]).
- Angiotensin II receptor antagonist. Like ACEI, the decrease in BP with these drugs is not accompanied by reflex tachycardia and, unlike those, they do not cause coughing or angioedema.

## Study purposes

- To determine the prevalence of cardiovascular risk factors in hypertensive patients receiving pharmacological treatment.
- To determine the values of the cardiovascular risk scales in hypertensive patients receiving pharmacological treatment.
- To determine the prevalence of altered values of cardiovascular risk scales in hypertensive patients receiving pharmacological treatment.

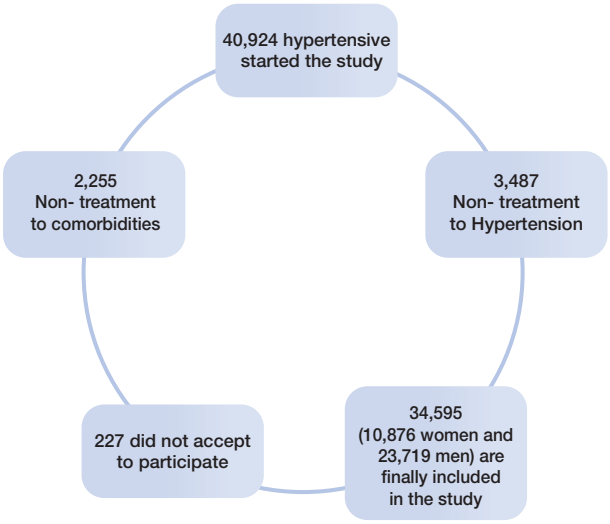
## Hypothesis

Hypertensive individuals, with or without associated comorbidity, who are receiving antihypertensive treatment, in addition to treatment for the associated comorbidity, have low control of cardiovascular risk factors and high values on the cardiovascular risk scales.

## Material and methods

Descriptive, cross-sectional, and observational study of 40,924 hypertensive patients. Of these, 2,255 were excluded because they were not receiving treatment for comorbidity, 3,847 were not taking their antihypertensive treatment and 227 did not agree to participate in the study. The final number of participants who met all the inclusion criteria was 34,595 (10,876 women and 23,719 men) with mean age of 51.61 years (51.38 years in women and 51.72 years in men). (See flow chart in **figure 1**).

**Figure 1:** Flowchart of participants.



***Inclusion criteria:***

- Being diagnosed hypertensive and on active antihypertensive treatment. In case of associated comorbidity, it must also be under active treatment.
- Age between 18 and 70 years.
- Agree to participate in the study.

***Parameters related to CVD risk included in the assessment:***

Anthropometric and clinical parameters. Anthropometric and clinical measurements and blood sampling to determine the analytical parameters were performed by the health personnel of the occupational health units involved in the study. For the collection of the different anthropometric parameters, international recommendations were followed. All measurements were performed by trained health personnel to minimize interobserver bias.

Weight (in kg) and height (in cm) were determined with a SECA 700 professional measuring scale. Abdominal waist circumference (cm) was calculated with a model 20 SECA Measuring Tape.

***Overweight and obesity scales:***

Body mass index (BMI) was obtained using the Quetelet index: weight in kilograms divided by the square of the height expressed in meters. Based on the BMI, four categories were established according to the classification of the Spanish Society for the Study of Malnutrition and Obesity (SEEDO)[7]: Underweight: BMI<18.5; Normal weight: BMI 18.5-24.9; Overweight: BMI 25-29.9; Obesity: BMI ≥ 30.

The waist / height ratio (ICALT) was considered high from 0.50.

CUN BAE. -44.988 + (0.503 × age) + (10.689 × sex) + (3.172 × BMI) - (0.026 × BMI2) + (0.181 × BMI × sex) - (0.02 × BMI × age) --- (0.005 × BMI2 × sex) + (0.00021 × BMI2 × age), where men = 0 and women = 1 with respect to sex, measuring age in years[8].

The following classifications were used to stratify into the different categories of overweight and obesity: • Male population: < 20% normal weight, 20-25% overweight, > 25% obesity • Female population: < 30% normal weight, 30-35% overweight, > 35% obesity.

ECORE-BF[9] –97.102 + 0.123 (age) + 11.9 (sex) + 35.959 (LnIMC) where male is equal to 0 and female is equal to 1. The authors propose the same cut-off points as CUN BAE.

Relative fat mass[10].

Women: 76- (20 x (height/w waist))
Men: 64- (20 x (height/w waist))
Suggested cut-off points are 40% in women and 30% in men.

Palafolls formula[11]. Men = ([BMI/BP] *10) + BMI. Women = ([BMI/BP] *10) + BMI + 10. The authors propose the same cut-off points as CUN BAE.

Deuremberg formula[12]. 1.2 x (BMI) + 0.23 x (Age in years) - 10.8 x (sex) - 5.4 where female is equal to 0 and male is equal to 1. It is considered obesity from 25.5% in men and 32% in women.

Body roundness index[13]

$$BRI = 364{,}2 - 365{,}5 \times \sqrt{1 - \left(\frac{(WC/(2\pi))^2}{(0{,}5\ height)^2}\right)}$$

Visceral adiposity index[14]

*Females:*

$$VAI = \left(\frac{WC}{36{,}58 + (1{,}89 \times BMI)}\right) \times \left(\frac{TG}{0{,}81}\right) \times \left(\frac{1{,}52}{HDL}\right)$$

*Males:*

$$VAI = \left(\frac{WC}{39{,}68 + (1{,}88 \times BMI)}\right) \times \left(\frac{TG}{1{,}03}\right) \times \left(\frac{1{,}31}{HDL}\right)$$

The waist circumference is expressed in cm and LDL and triglycerides in mmol/L. Obesity cut-off points vary with age.

Normalized weight-adjusted index (NWAI)[15].

NWAI= [(weight/10) – (10 x height) + 10] weight in kg and height in meters

Blood pressure was determined after a resting period of about 10 minutes in the supine position, using a calibrated OMRON M3 automatic sphygmomanometer. Three consecutive readings at one-minute intervals were taken and the mean value of the three measurements was calculated. The measurements were classified according to the ESH/ESC criteria[16]: Normal BP: SBP < 130 mmHg and/or DBP < 85 mmHg; Pre-HT: SBP 130-139 mmHg and/or DBP 85-89 mmHg; HT 1: SBP 140-159 mmHg and/or DBP 90-99 mmHg; HT 2: SBP > 160 mmHg and/or DBP > 100 mmHg.

Analytical parameters. Blood extraction to determine the analytical parameters included in the study was performed by peripheral venipuncture in the same session and at the same place as the anamnesis and physical examination, after a minimum overnight fast of 12 hours. Values were expressed in milligrams/deciliter (mg/dL). The values to define the presence or absence of diabetes were defined based on the 2013 American Diabetes Association recommendations. Fasting plasma glucose: Normal < 100 mg/dl. Altered basal blood glucose: 100-125 mg/dl. Diabetes > 125 mg/dl. The cut-off values for lipids

have been defined based on those included in the 2010 SEMERGEN-SEA Consensus Document for the approach to dyslipemic patients[17].

Atherogenic indices. For the different atherogenic indices, the formulas accepted by the scientific community were used. For each index different cut-off points were defined to establish the atherogenic risk categories according to the existing data in the literature[18].

### *Metabolic Syndrome.*

- NCEP ATP III criteria[19] (Adult Treatment Panel III National Cholesterol Educational Program). At least 3 of the following risk factors are required: Waist circumference >102 cm in men and >88 cm in women. Serum triglycerides ≥ 150 mg/dL or being on specific treatment for this lipid abnormality. Blood pressure ≥ 130/85 mm Hg or being on specific treatment with antihypertensive drugs. cHDL < 40 mg/dL in men and < 50 mg/dL in women or being on specific treatment for this lipid abnormality. Fasting blood glucose > 100 mg/dL or being on specific treatment with antidiabetic drugs.
- International Diabetes Federation (IDF) criteria[20]. Central obesity defined as waist circumference ≥ 94 cm for Caucasian men and ≥ 80 cm and at least two of the 4 factors mentioned above in NCEP-ATPIII are compulsory.
- JIS criteria: presence of at least three of the following factors: abdominal obesity (waist circumference ≥ 94 cm in men and ≥ 80 cm in women); triglycerides ≥ 150 mg/dl or treatment; HDL cholesterol <40 mg/dl in men and <50 mg/dl in women or treatment; blood pressure ≥ 130/85 mmHg or treatment; fasting glucose ≥ 100 mg/dl or treatment[21].

### *Cardiovascular risk scales*

- REGICOR scale (*Registro Gironí del Cor*): Framinghan model calibrated for the Spanish population. The REGICOR tables allow estimation of the risk of suffering a coronary event (angina, symptomatic or silent myocardial infarction and/or death of coronary origin) in the following 10 years. The REGICOR tables are only applicable to subjects aged 35 to 74 years old. Each subject is classified as: < 5%: low risk, 5-9.9% moderate risk, 10 -14.9% high risk and ≥15% very high risk[22].
- DORICA scale[23]. It also indicates the risk of suffering a coronary event within the following 10 years. It is considered low risk < 5, slight risk 5-9, moderate risk 10 -19, high risk 20 -39 and very high risk ≥ 40.
- SCORE (Systematic Coronary Risk Evaluation) scale presents differential tables according to the country's risk level[24]. It estimates the risk of cardiovascular and cerebrovascular death within 10 years. The version for low-risk countries, recommended for Spain[25], was used. It is considered low risk < 3%, moderate risk 4-5% and high risk > 5%[26].
- ERICE scale (Spanish Cardiovascular Risk Equation). Estimates the risk of suffering a fatal or non-fatal cerebrovascular event over a 10-year period. The tables apply to people between 30 and 80 years old. Low risk <5%: low risk, mild risk 5-9%, moderate risk 10-14%, moderate-high risk 15-19%, high risk 20-39% and very high risk over 30%[27].
- Framingham categories[28].
- Framingham vascular age[29]. This tool has its origin in the Framingham cardiovascular risk scale, which can be calculated from the age of 30 years.
- SCORE vascular age[30]. This tool has its origin in the SCORE cardiovascular risk scale. As with the scale from which it derives, it can be calculated in persons between 40 and 65 years.

### *Nonalcoholic fatty liver scales:*

- Fatty liver index[31]

$$FLI = (e^{0.953*\log_e(\text{triglycerides}) + 0.139*BMI + 0.718*\log_e(ggt) + 0.053*\text{waist circumference} - 15.745}) / (1 + e^{0.953*\log_e(\text{triglycerides}) + 0.139*BMI + 0.718*\log_e(ggt) + 0.053*\text{waist circumference} - 15.745}) \times 100$$

A FLI with values over 60 is considered high risk.

- Hepatic steatosis index[32]

HSI = 8 x ALT / AST + BMI (+ 2 if diabetes 2, + 2 if female)
Values over 36 are considered high risk.

- ZJU index[33]

BMI (kg / m 2) + Blood glucose (mmol / L) + TG (mmol / L) + 3 * ALT (IU / L) / AST (IU / L) ratio (+ 2 if female).
Values over 38 are considered high risk.

- Framingham steatosis index[34]

- 7.981 + 0.011 × age(years)–0.146 × sex (female = 1, male = 0) + 0.173 × BMI(kg/m2) + 0.007 × triglycerides(mg/dl) + 0.593 × hypertension(yes = 1, no = 0) + 0.789 × diabetes(yes = 1, no = 0) + 1.1 × ALT/ AST ratio ≥ 1.33(yes = 1, no = 0).

Values over 28 are considered high risk.

- Lipid accumulation product[35].

- In men: (waist circumference (cm) - 65) x (triglyceride concentration (mMol)).
- In women: (waist circumference (cm) - 58) x (triglyceride concentration (mMol))

Other parameters related to cardiovascular risk:

- Triglyceride glucose index triglyceride glucose index-IMC, triglyceride glucose index-p waist TyGindex = LN (TG [mg/dl] × blood glucose [mg/dl]/2). TyGindex-IMC = TyGindex x IMC TyGindex-p waist = TyGindex x p waist[36-39].
- Waist weight index. This indicator is calculated by applying the formula. WWI = waist circumference / √weight
- Cardiometabolic index[40] is calculated by multiplying the waist-height index by the atherogenic triglycerides / HDL-c index.

- Atherogenic dyslipidemia and lipid triad[41]. Atherogenic dyslipidemia is characterized by elevated triglyceride levels (> 150 mg / dl), low HDL (<40 mg / dl in men and <50 mg / dl in women), and normal or mildly elevated LDL. If LDL values are high (> 160 mg / dl) we speak of lipid triad.

### *Statistical analysis.*

The SPSS 27.0 package was used for the statistical study. For the initial descriptive analysis, once the normal distribution had been verified and following the Kolmogorov-Smirnov method, the mean and standard deviation values were used. In subsequent analyses, when the variable was continuous, the comparison of means was performed using Student's t test if the variable followed a normal distribution, or the nonparametric Mann-Whitney U test if it did not meet the normality criterion. When the variable was qualitative, Pearson's chi-squared test was used to compare proportions, with a confidence level of 95%. ROC curves were used to calculate the cut-off points. P values less than 0.05 were considered statistically significant.

## Results

The anthropometric, clinical, analytical, and sociodemographic characteristics of the 24,595 people who entered the study are presented in **table II**.

The mean values of the different scales that assess overweight and obesity are presented in **table III**. The results are divided in each sex according to treatment. The highest values appear in almost all cases and in both sexes in the group of people being treated for HT, dyslipidemia, and diabetes.

The values of blood pressure and analytical parameters do not show a homogeneous pattern according to the treatment being received in either sex. The complete data are shown in **table IV**.

Almost all the cardiovascular risk scales studied show higher values in the group of people being treated for the three conditions (HT, dyslipidemia, and diabetes), and this is true for both sexes. The complete data are presented in **table V**.

As shown in **table VI**, the fatty liver scales show higher values in the group receiving the three treatments, in both sexes. The same occurs with the atherogenic indices and with the other metabolic indicators.

When the prevalence of high values of the overweight and obesity scales is evaluated, it is found that in both sexes the highest prevalences are found in the group that receives hypertensive treatment in addition to treatment for dyslipidemia and diabetes. The complete data can be found in **table VII**.

**Table II:** Anthropometric, clinical, analytical, and sociodemographic characteristics of the population.

| | Men n=10,876 Mean (sd) | Women n=23,719 Mean (sd) | Total n=34,595 Mean (sd) | p |
|---|---|---|---|---|
| Age (years) | 51.38 (8.23) | 51.72 (7.78) | 51.61 (7.93) | <0.0001 |
| Height (cm) | 159.61 (6.58) | 172.68 (6.97) | 168.57 (9.15) | <0.0001 |
| Weight (kg) | 73.92 (15.50) | 88.86 (15.93) | 84.16 (17.25) | <0.0001 |
| Waist (cm) | 79.15 (12.02) | 90.52 (11.52) | 86.95 (12.81) | <0.0001 |
| SBP (mmHg) | 132.35 (18.54) | 139.04 (18.10) | 136.94 (18.50) | <0.0001 |
| DBP (mmHg) | 80.90 (11.19) | 85.29 (11.16) | 83.91 (11.36) | <0.0001 |
| Cholesterol (mg/dl) | 207.47 (36.68) | 200.20 (38.36) | 202.49 (37.99) | <0.0001 |
| HDL (mg/dl) | 53.39 (7.96) | 46.07 (8.18) | 48.37 (8.79) | <0.0001 |
| LDL (mg/dl) | 130.77 (35.73) | 124.36 (36.81) | 126.41 (36.59) | <0.0001 |
| Triglycerides (mg/dl) | 117.50 (63.98) | 154.14 (99.67) | 142.62 (91.58) | <0.0001 |
| Blood glucose (mg/dl) | 97.49 (25.06) | 105.73 (32.37) | 103.14 (30.50) | <0.0001 |
| GPT (U/L) | 24.05 (13.84) | 33.95 (19.00) | 30.86 (18.15) | <0.0001 |
| GOT (U/L) | 20.00 (8.68) | 25.64 (11.95) | 23.77 (11.29) | <0.0001 |
| GGT (U/L) | 27.46 (27.26) | 48.04 (53.48) | 41.63 (47.86) | <0.0001 |
| | % | % | % | p |
| 20-49 years | 36.63 | 34.73 | 35.33 | <0.0001 |
| 50-70 years | 63.37 | 65.27 | 64.67 | |
| Social Class I-II | 19.44 | 19.63 | 19.57 | <0.0001 |
| Social Class III | 80.56 | 80.37 | 80.43 | |
| Non-smokers | 68.46 | 67.84 | 68.04 | 0.476 |
| Smokers | 31.54 | 32.16 | 31.96 | |
| HT | 53.82 | 43.12 | 46.48 | <0.0001 |
| Diabetes + HT | 18.82 | 22.26 | 21.18 | <0.0001 |
| Dyslipidemia + HT | 16.96 | 18.86 | 18.27 | <0.0001 |
| Diabetes + dyslipidemia + HT | 10.40 | 15.76 | 14.07 | <0.0001 |

**Table III:** Mean values of overweight-obesity indicators according to drug consumption by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) | HT+Diab n=2,047 Mean (sd) | HT+DLP n=1,845 Mean (sd) | HT+DLP+Diab n=1,131 Mean (sd) | p | HT n=10,228 Mean (sd) | HT+Diab n=5,280 media (sd) | HT+DLP n=4,474 media (sd) | HT+DLP+Diab n=3,737 media (sd) | p |
| Age | 49.47 (8.59) | 51.85 (7.70) | 54.13 (6.89) | 55.91 (5.76) | <0.0001 | 49.88 (8.28) | 52.40 (7.52) | 52.75 (7.06) | 54.57 (6.13) | <0.0001 |
| BMI | 28.81 (5.87) | 29.93 (5.91) | 28.05 (5.11) | 29.85 (5.16) | <0.0001 | 29.56 (4.80) | 30.17 (5.00) | 29.19 (4.30) | 30.39 (4.63) | <0.0001 |
| Waist/Height | 0.49 (0.08) | 0.50 (0.07) | 0.48 (0.07) | 0.50 (0.07) | <0.0001 | 0.52 (0.06) | 0.53 (0.06) | 0.52 (0.06) | 0.53 (0.06) | <0.0001 |
| CUN BAE | 40.85 (6.51) | 42.38 (6.29) | 40.65 (5.64) | 42.88 (5.25) | <0.0001 | 30.45 (5.84) | 31.43 (5.81) | 30.35 (5.24) | 31.97 (5.33) | <0.0001 |
| ECORE-BF | 41.04 (7.13) | 42.72 (7.01) | 40.78 (6.33) | 43.28 (6.01) | <0.0001 | 30.35 (5.73) | 31.39 (5.74) | 30.33 (5.24) | 31.98 (5.33) | <0.0001 |
| RFM | 34.86 (5.90) | 35.36 (5.74) | 33.83 (5.46) | 35.54 (5.11) | <0.0001 | 25.31 (4.73) | 25.43 (4.61) | 24.83 (4.56) | 25.66 (4.44) | <0.0001 |
| Palafolls | 42.43 (6.13) | 43.66 (6.18) | 41.71 (5.34) | 43.60 (5.38) | <0.0001 | 32.81 (5.00) | 33.49 (5.22) | 32.48 (4.49) | 33.74 (4.83) | <0.0001 |
| IMG | 40.56 (7.31) | 42.45 (7.26) | 40.71 (6.29) | 43.28 (6.19) | <0.0001 | 30.74 (6.02) | 32.06 (6.16) | 30.96 (5.37) | 32.82 (5.60) | <0.0001 |
| NWAI | 1.38 (1.52) | 1.66 (1.52) | 1.20 (1.30) | 1.66 (1.31) | <0.0001 | 1.56 (1.45) | 1.74 (1.50) | 1.45 (1.28) | 1.80 (1.38) | <0.0001 |
| BRI | 3.41 (1.52) | 3.51 (1.46) | 3.12 (1.26) | 3.48 (1.28) | <0.0001 | 3.92 (1.33) | 3.94 (1.31) | 3.76 (1.19) | 3.98 (1.22) | <0.0001 |
| VAI | 3.50 (2.06) | 3.70 (2.17) | 3.94 (2.93) | 4.51 (2.62) | <0.0001 | 9.65 (7.29) | 10.27 (8.02) | 10.88 (7.87) | 12.29 (10.02) | <0.0001 |

*BMI. Body Mass Index. CUN BAE. Body Adiposity Estimator of the Clínica Universitaria de Navarra. ECORE-BF. Cordoba-Body Fat Equation. RFM Relative fat mass. IMG Fat mass index, NWAI Normalized weight adjusted index. BRI Body Roundness Index, VAI Visceral Adiposity Index.*

**Table IV:** Mean values of blood pressure and analytical parameters according to drug consumption by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) | HT+Diab n=2,047 Mean (sd) | HT+DLP n=1,845 Mean (sd) | HT+DLP+Diab n=1,131 Mean (sd) | p | HT n=10,228 Mean (sd) | HT+Diab n=5,280 media (sd) | HT+DLP n=4,474 media (sd) | HT+DLP+Diab n=3,737 media (sd) | p |
| TSBP | 131.50 (18.41) | 134.60 (18.79) | 130.91 (18.65) | 135.07 (17.99) | <0.0001 | 140.31 (18.40) | 136.42 (17.10) | 139.04 (18.10) | 140.51 (17.97) | <0.0001 |
| DBP | 81.24 (11.39) | 81.67 (11.09) | 79.31 (10.75) | 80.33 (10.72) | <0.0001 | 83.80 (10.66) | 85.29 (11.16) | 83.80 (10.66) | 85.76 (11.07) | <0.0001 |
| Cholesterol | 208.03 (35.53) | 207.42 (35.09) | 209.75 (40.10) | 200.91 (38.84) | <0.0001 | 204.04 (36.21) | 198.72 (35.50) | 199.89 (41.27) | 192.17 (42.72) | <0.0001 |
| HDL | 54.09 (8.49) | 53.02 (7.67) | 52.93 (7.21) | 51.13 (6.07) | <0.0001 | 47.13 (8.42) | 45.41 (7.98) | 45.86 (7.85) | 44.37 (7.73) | <0.0001 |
| LDL | 131.89 (34.41) | 130.88 (33.90) | 132.31 (38.99) | 122.33 (38.89) | <0.0001 | 128.79 (34.67) | 124.35 (34.85) | 122.33 (39.09) | 114.44 (4.21) | <0.0001 |
| Triglycerides (mg/dl) | 110.93 (55.79) | 117.66 (60.69) | 125.14 (81.65) | 138.76 (70.41) | <0.0001 | 144.64 (87.45) | 149.30 (99.43) | 164.74 (103.09) | 174.28 (120.90) | <0.0001 |
| Blood glucose (mg/dl) | 92.37 (16.12) | 104.15 (33.26) | 95.33 (17.77) | 115.45 (40.42) | <0.0001 | 97.32 (19.92) | 113.63 (40.15) | 99.63 (19.93) | 124.85 (46.06) | <0.0001 |
| GPT | 23.11 (12.73) | 23.48 (14.97) | 25.34 (13.21) | 27.21 (16.42) | <0.0001 | 32.82 (18.53) | 33.15 (18.48) | 35.77 (19.27) | 35.57 (20.20) | <0.0001 |
| GOT | 20.01 (8.49) | 19.76 (10.32) | 20.09 (6.88) | 20.40 (7.94) | <0.0001 | 24.77 (9.29) | 25.20 (11.59) | 27.23 (15.31) | 26.57 (13.27) | <0.0001 |
| GGT | 25.95 (24.34) | 26.91 (23.99) | 28.16 (22.80) | 34.05 (44.67) | <0.0001 | 45.60 (52.84) | 45.27 (49.41) | 51.44 (51.51) | 53.69 (61.34) | <0.0001 |

**Table V:** Mean values of cardiovascular risk scales according to drug use by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) | HT+Diab n=2,047 Mean (sd) | HT+DLP n=1,845 Mean (sd) | HT+DLP+Diab n=1,131 Mean (sd) | p | HT n=10,228 Mean (sd) | HT+Diab n=5,280 media (sd) | HT+DLP n=4,474 media (sd) | HT+DLP+Diab n=3,737 media (sd) | p |
| ALLY EV SCORE | 6.69 (5.38) | 7.66 (5.60) | 7.56 (5.22) | 8.42 (5.10) | <0.0001 | 10.47 (7.26) | 11.29 (7.27) | 10.39 (7.20) | 11.38 (7.16) | <0.0001 |
| SCORE | 0.85 (1.28) | 1.21 (1.54) | 1.32 (1.55) | 1.67 (1.60) | <0.0001 | 2.65 (2.77) | 3.18 (3.06) | 2.94 (2.83) | 3.37 (3.00) | <0.0001 |
| ALLY EV FRAMINGHAM | 14.99 (12.92) | 29.46 (10.21) | 14.89 (12.56) | 28.85 (9.46) | <0.0001 | 16.03 (9.97) | 26.53 (8.85) | 15.97 (10.17) | 26.62 (8.63) | <0.0001 |
| REGICOR | 3.30 (2.19) | 3.93 (2.19) | 3.41 (2.18) | 3.81 (2.72) | <0.0001 | 3.75 (2.44) | 4.08 (3.00) | 3.65 (2.42) | 4.12 (3.06) | <0.0001 |
| ERICE | 5.36 (4.62) | 9.17 (7.29) | 7.65 (4.52) | 12.50 (6.67) | <0.0001 | 10.31 (6.69) | 15.73 (9.14) | 12.14 (6.94) | 17.60 (8.62) | <0.0001 |
| DORICA | 4.98 (3.48) | 6.51 (4.28) | 6.27 (3.76) | 8.14 (4.64) | <0.0001 | 9.14 (5.61) | 10.71 (6.42) | 9.51 (5.53) | 11.46 (7.12) | <0.0001 |
| CVD RISK | 9.76 (6.83) | 12.11 (8.11) | 11.19 (6.94) | 14.47 (8.63) | <0.0001 | 19.22 (10.16) | 22.62 (10.54) | 20.95 (10.14) | 24.93 (10.01) | <0.0001 |
| Framingham categories | 6.00 (4.24) | 7.80 (5.36) | 7.46 (4.45) | 10.03 (5.97) | <0.0001 | 11.61 (7.32) | 13.95 (8.75) | 12.20 (7.43) | 15.05 (9.33) | <0.0001 |
| Framingham categories duro | 3.07 (2.97) | 4.31 (4.13) | 3.94 (3.35) | 5.92 (4.92) | <0.0001 | 8.87 (6.31) | 10.87 (7.83) | 9.35 (6.38) | 11.84 (8.59) | <0.0001 |

*ALLY EV. Lost years of vascular age. CVD RISK. Cardiovascular*

**Table VI:** Mean values of fatty liver scales and atherogenic indices according to drug consumption by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) | HT+Diab n=2,047 Mean (sd) | HT+DLP n=1,845 Mean (sd) | HT+DLP+Diab n=1,131 Mean (sd) | p | HT n=10,228 Mean (sd) | HT+Diab n=5,280 media (sd) | HT+DLP n=4,474 media (sd) | HT+DLP+Diab n=3,737 media (sd) | p |
| Fatty liver index | 32.74 (27.64) | 37.55 (28.24) | 30.99 (25.29) | 41.28 (27.85) | <0.0001 | 54.60 (27.46) | 56.43 (26.93) | 56.11 (26.09) | 61.58 (26.47) | <0.0001 |
| Hepatic steatosis index | 40.22 (7.38) | 42.67 (7.32) | 39.51 (6.59) | 43.42 (6.58) | <0.0001 | 39.54 (6.90) | 41.72 (6.90) | 39.20 (6.24) | 42.28 (6.32) | <0.0001 |
| ZJU index | 40.95 (6.65) | 42.22 (7.30) | 40.28 (5.56) | 43.79 (6.66) | <0.0001 | 40.14 (5.59) | 41.16 (6.31) | 40.18 (5.46) | 42.72 (6.46) | <0.0001 |
| Fatty liver disease index | 33.90 (6.44) | 34.69 (6.69) | 33.12 (5.32) | 35.98 (6.14) | <0.0001 | 34.89 (5.40) | 35.49 (5.80) | 34.80 (5.10) | 36.44 (5.48) | <0.0001 |
| Lipid accumulation product | 28.45 (24.86) | 30.29 (24.60) | 27.66 (25.93) | 35.59 (27.66) | <0.0001 | 44.67 (38.91) | 45.27 (40.14) | 45.98 (38.59) | 53.12 (48.19) | <0.0001 |
| IA cholesterol/HDL | 3.94 (0.91) | 3.98 (0.85) | 4.04 (0.96) | 3.98 (0.90) | <0.0001 | 4.47 (1.15) | 4.52 (1.17) | 4.48 (1.21) | 4.47 (1.31) | <0.0001 |
| IA Triglycerids/HDL | 2.13 (1.21) | 2.30 (1.33) | 2.45 (1.83) | 2.80 (1.62) | <0.0001 | 3.24 (2.26) | 3.47 (2.54) | 3.77 (2.61) | 4.15 (3.19) | <0.0001 |
| IA LDL/HDL | 2.51 (0.82) | 2.52 (0.76) | 2.55 (0.86) | 2.43 (0.83) | <0.0001 | 2.84 (0.98) | 2.84 (1.00) | 2.75 (1.03) | 2.67 (1.11) | <0.0001 |
| IA HDL/LDL+VLDL | 0.38 (0.14) | 0.37 (0.12) | 0.37 (0.12) | 0.37 (0.12) | <0.0001 | 0.33 (0.12) | 0.32 (0.13) | 0.33 (0.13) | 0.34 (0.14) | <0.0001 |
| IA cholesterol-HDL | 153.94 (36.64) | 154.40 (35.84) | 156.83 (40.81) | 149.77 (39.56) | <0.0001 | 156.91 (37.38) | 153.32 (36.97) | 154.03 (42.05) | 147.80 (43.89) | <0.0001 |
| Cardiometabolic index | 1.08 (0.69) | 1.17 (0.74) | 1.20 (0.91) | 1.43 (0.89) | <0.0001 | 1.74 (1.31) | 1.86 (1.45) | 1.98 (1.42) | 2.23 (1.81) | <0.0001 |
| Triglyceride glucose index | 8.43 (0.49) | 8.59 (0.56) | 8.57 (0.50) | 8.84 (0.61) | <0.0001 | 8.71 (0.55) | 8.86 (0.64) | 8.83 (0.60) | 9.09 (0.67) | <0.0001 |
| Waist triglyceride index | 101.15 (56.99) | 107.40 (59.71) | 109.68 (74.25) | 126.53 (69.41) | <0.0001 | 150.91 (98.50) | 154.93 (108.39) | 166.98 (108.63) | 181.13 (131.67) | <0.0001 |
| Waist weight index | 9.28 (0.78) | 9.20 (0.67) | 9.13 (0.70) | 9.21 (0.65) | <0.0001 | 9.67 (0.74) | 9.59 (0.68) | 9.59 (0.70) | 9.60 (0.68) | <0.0001 |

**Table VII:** Prevalence of overweight-obesity with different scales according to drug consumption by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) % | HT+Diab n=2,047 Mean (sd) % | HT+DLP n=1,845 Mean (sd) % | HT+DLP+Diab n=1,131 Mean (sd) % | p | HT n=10,228 Mean (sd) % | HT+Diab n=5,280 media (sd) % | HT+DLP n=4,474 media (sd) % | HT+DLP+Diab n=3,737 media (sd) % | p |
| Waist/Height >0,50 | 40.80 | 45.43 | 34.09 | 47.30 | <0.0001 | 61.61 | 62.71 | 59.50 | 64.97 | <0.0001 |
| BMI obesity | 37.50 | 44.70 | 29.76 | 42.79 | <0.0001 | 41.13 | 45.72 | 38.44 | 49.69 | <0.0001 |
| BMI overweight | 34.00 | 34.49 | 40.81 | 41.82 | | 43.56 | 41.99 | 46.69 | 40.49 | |
| CUN BAE obesity | 81.12 | 87.40 | 85.31 | 94.08 | <0.0001 | 83.54 | 87.56 | 85.49 | 91.73 | <0.0001 |
| CUN BAE overweight | 14.37 | 10.26 | 11.82 | 5.31 | | 13.69 | 10.81 | 12.43 | 7.55 | |
| ECORE-BF obesity | 79.51 | 85.69 | 83.09 | 93.37 | <0.0001 | 83.52 | 87.56 | 85.38 | 91.30 | <0.0001 |
| ECORE-BF overweight | 15.27 | 11.33 | 12.95 | 5.13 | | 13.54 | 10.70 | 12.41 | 7.76 | |
| RFM obesity | 55.37 | 59.94 | 49.92 | 62.69 | <0.0001 | 71.04 | 71.82 | 69.18 | 73.67 | <0.0001 |

*BMI. Body Mass Indez. CUN BAE. Clínica Universitaria de Navarra Body Adiposity Estimator. ECORE-BF. Equation Córdoba-Body Fat. RFM Relative Fat Mass.*

**Table VIII:** Prevalence of altered blood pressure values and analytical parameters according to drug use by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) % | HT+Diab n=2,047 Mean (sd) % | HT+DLP n=1,845 Mean (sd) % | HT+DLP+Diab n=1,131 Mean (sd) % | p | HT n=10,228 Mean (sd) % | HT+Diab n=5,280 media (sd) % | HT+DLP n=4,474 media (sd) % | HT+DLP+Diab n=3,737 media (sd) % | p |
| HT | 38.97 | 44.41 | 35.34 | 44.30 | <0.0001 | 56.20 | 58.24 | 48.39 | 59.03 | <0.0001 |
| Cholesterol ≥ 200 | 57.66 | 57.16 | 55.72 | 44.47 | <0.0001 | 53.09 | 47.27 | 46.58 | 37.97 | <0.0001 |
| LDL > 130 | 50.86 | 49.73 | 48.08 | 36.25 | <0.0001 | 47.93 | 43.81 | 40.93 | 32.99 | <0.0001 |
| Triglycerides > 150 | 17.17 | 20.66 | 23.96 | 32.54 | <0.0001 | 34.74 | 36.63 | 44.23 | 46.96 | <0.0001 |
| Blood glucosa 100-125 | 19.78 | 26.18 | 27.05 | 29.44 | <0.0001 | 29.26 | 32.23 | 35.83 | 32.70 | <0.0001 |
| Blood glucosa > 125 | 2.00 | 12.85 | 3.36 | 24.49 | <0.0001 | 4.61 | 21.33 | 5.30 | 32.00 | <0.0001 |

**Table IX:** Percentage of patients with controlled blood pressure figures according to treatments received.

| | Women n=10,876 % HT controlled | Men n=23,719 % HT controlled | Total n=34,595 % HT controlled |
|---|---|---|---|
| HT + Dislypemia + diabetes | 55.70 | 40.97 | 44.39 |
| HT | 61.03 | 43.80 | 50.07 |
| HT + diabetes | 55.59 | 41.76 | 45.63 |
| HT + dislypemia | 64.66 | 51.61 | 55.42 |
| Mean | 59.25 | 44.54 | 49.31 |

**Table VIII** shows the prevalence of HT and analytical abnormalities in treated patients. **Table IX** shows that women overall have controlled blood pressure in 59.25% of cases, while in men the figure drops to 44.54%.

**Table X** shows that most of the scales for cardiovascular risk, metabolic syndrome and atherogenic dyslipidemia have higher prevalence of altered values in the group receiving antihypertensive treatment, as opposed to dyslipidemia and diabetes, which is the same in both sexes.

## Discussion

No prior study has been found in the literature that assesses the degree of blood pressure control in hypertensive patients with comorbidities (dyslipidemia and diabetes), nor any previous work that focuses on the control of cardiovascular risk parameters or scales in hypertensive patients under treatment; therefore, we cannot compare our results with those of other preceding authors.

For the discussion we will focus on the degree of control of blood pressure in hypertensive patients under treatment.

Remarkably, the overall degree of control of blood pressure in our study was 49.31% (59.25% in women and 44.54% in men).

In a study of 124 patients with an average age of 68 years in ten community pharmacies in different areas of the Valencian Community (Spain), 46.80% of these patients were not under control. Almost half of the patients treated with antihypertensive drugs presented out-of-range blood pressure values according to the 2018 European Guideline for the management of hypertension[42]. Another study in 265 hypertensive individuals on treatment showed control of blood pressure figures in 33% of males versus 49% of females. These studies rank an intermediate-low position compared to other previous studies on Spanish and European populations[43]. Despite this, a significant margin for improvement remains, as shown by the more favorable results presented by studies in Denmark[44], Canada and the United States and other European countries[45] with a control percentage of more than 50% in treated subjects.

An important Spanish study, Di@bet.es, showed that only 26.6% have controlled blood pressure, higher in women (24.90%) than in men (16%)[46]. Di@bet.es is a national study designed to estimate the prevalence of diabetes *mellitus* and other cardiovascular risk factors in

the Spanish adult population. It presents the prevalence of arterial hypertension and the degree to which it is recognized, treated, and controlled. A sample of the Spanish population with 5,048 adults aged ≥ 18 years was included. A clinical interrogation and examination including three resting and sitting blood pressure readings were performed to calculate the mean. Hypertension is defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg and/or on antihypertensive drug treatment. The data are lower than those obtained in our study, perhaps because all the people in our study received treatment. The factors associated with poorer control were male sex, overweight or obesity, and an associated diagnosis of diabetes *mellitus*.

Prior to this study, the data on HT control in our country were more encouraging, and even previous registries

**Table X:** Prevalence of altered values of CVR scales and metabolic scales with different scales according to drug consumption by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) % | HT+Diab n=2,047 Mean (sd) % | HT+DLP n=1,845 Mean (sd) % | HT+DLP+Diab n=1,131 Mean (sd) % | p | HT n=10,228 Mean (sd) % | HT+Diab n=5,280 media (sd) % | HT+DLP n=4,474 media (sd) % | HT+DLP+Diab n=3,737 media (sd) % | p |
| Moderate SCORE | 7.56 | 11.01 | 11.88 | 16.09 | <0.0001 | 23.33 | 25.95 | 25.57 | 28.91 | <0.0001 |
| High SCORE | 2.84 | 4.74 | 5.04 | 5.15 | | 20.43 | 26.62 | 24.30 | 29.13 | |
| Moderate ALLY EV SCORE | 14.31 | 14.38 | 15.22 | 18.54 | <0.0001 | 11.79 | 11.40 | 12.11 | 11.67 | <0.0001 |
| High ALLY EV SCORE | 51.05 | 40.97 | 39.05 | 36.53 | | 55.87 | 60.88 | 55.83 | 62.04 | |
| Moderate REGICOR | 20.95 | 26.00 | 23.95 | 25.96 | <0.0001 | 26.67 | 28.65 | 26.07 | 27.90 | <0.0001 |
| High-very high REGICOR | 1.74 | 5.31 | 1.64 | 3.64 | | 2.94 | 5.12 | 2.49 | 5.23 | |
| Moderate ALLY EV Framingham | 18.82 | 8.25 | 17.40 | 5.66 | <0.0001 | 29.18 | 11.87 | 26.82 | 10.34 | <0.0001 |
| High ALLY EV Framingham | 45.41 | 86.32 | 47.30 | 89.38 | | 42.51 | 83.94 | 43.89 | 85.56 | |
| Moderate-moderately high ERICE | 11.63 | 26.62 | 23.46 | 41.15 | <0.0001 | 45.51 | 48.10 | 54.88 | 55.18 | <0.0001 |
| High-very high ERICE | 0.19 | 5.93 | 0.00 | 12.39 | | 11.38 | 20.50 | 16.51 | 25.05 | |
| Moderate DORICA | 12.23 | 20.89 | 19.51 | 31.72 | <0.0001 | 31.73 | 39.46 | 34.52 | 40.69 | <0.0001 |
| High-very high DORICA | 0.30 | 1.25 | 0.67 | 2.88 | | 6.05 | 9.16 | 6.76 | 11.90 | |
| Sd MTB ATP III | 30.33 | 55.54 | 50.51 | 100.00 | <0.0001 | 33.15 | 56.16 | 68.10 | 100.00 | <0.0001 |
| Sd MTB ATP IDF | 30.31 | 46.80 | 35.34 | 47.39 | <0.0001 | 29.34 | 38.71 | 32.32 | 39.84 | <0.0001 |
| Sd MTB ATP JIS | 35.01 | 60.33 | 58.43 | 99.12 | <0.0001 | 54.28 | 82.12 | 72.42 | 99.36 | <0.0001 |
| Sd MTB ATP SZABO | 47.02 | 94.87 | 91.33 | 99.91 | <0.0001 | 56.03 | 97.14 | 92.38 | 99.89 | <0.0001 |
| Atherogenic dyslipemia | 10.25 | 13.53 | 14.58 | 22.99 | <0.0001 | 14.73 | 18.64 | 18.26 | 25.26 | <0.0001 |
| Lipid Triad | 2.82 | 2.88 | 3.69 | 3.98 | <0.0001 | 4.01 | 3.88 | 4.29 | 3.98 | <0.0001 |
| Hypertriglyceridemic waistline | 4.89 | 4.79 | 4.28 | 8.66 | <0.0001 | 15.16 | 16.34 | 17.21 | 22.10 | <0.0001 |

*ALLY EV. Lost years of vascular age.*

**Table XI:** Prevalence of altered values of fatty liver scales and metabolic indices according to drug consumption by sex.

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HT n=5,853 Mean (sd) % | HT+Diab n=2,047 Mean (sd) % | HT+DLP n=1,845 Mean (sd) % | HT+DLP+Diab n=1,131 Mean (sd) % | p | HT n=10,228 Mean (sd) % | HT+Diab n=5,280 media (sd) % | HT+DLP n=4,474 media (sd) % | HT+DLP+Diab n=3,737 media (sd) % | p |
| High Fatty liver index | 19.83 | 24.97 | 16.07 | 27.94 | <0.0001 | 45.48 | 47.49 | 47.12 | 55.88 | <0.0001 |
| High Hepatic steatosis index | 69.25 | 82.10 | 71.09 | 90.08 | <0.0001 | 68.60 | 81.23 | 68.51 | 85.06 | <0.0001 |
| High ZJU index | 61.32 | 68.67 | 66.41 | 77.10 | <0.0001 | 62.13 | 66.04 | 63.20 | 75.50 | <0.0001 |
| High Fatty liver disease index | 53.12 | 50.26 | 64.58 | 57.63 | <0.0001 | 60.57 | 59.19 | 67.40 | 52.76 | <0.0001 |
| Moderate IA colesterol/HDL | 23.71 | 24.82 | 26.94 | 25.73 | <0.0001 | 28.47 | 30.91 | 29.28 | 25.73 | <0.0001 |
| High IA colesterol/HDL | 0.41 | 0.39 | 0.65 | 0.35 | | 0.15 | 0.28 | 0.34 | 0.35 | |
| High IA triglicéridos/HDL | 16.88 | 19.83 | 28.30 | 32.98 | <0.0001 | 40.99 | 44.77 | 52.06 | 56.81 | <0.0001 |
| High IA LDL/HDL | 25.44 | 25.11 | 27.21 | 22.46 | <0.0001 | 40.02 | 41.72 | 38.69 | 52.59 | <0.0001 |
| High IA colesterol-HDL | 74.83 | 75.57 | 73.66 | 69.76 | <0.0001 | 76.96 | 74.28 | 71.28 | 64.52 | <0.0001 |

*ALLY EV. Lost years of vascular age.*

carried out in series, with similar methodologies, such as the PRESCAP[47] 2002, 2006 and 2010 or CARDIOTENS[48] 1999 and 2009 registries, had shown a temporary trend towards a continuous improvement in the degree of control. The PRESCAP studies showed how the percentage of controlled hypertensive patients progressively improved in recent years, from 36% in 2002 to 41.50% in 2006 and 47% in 2010. Similarly, the CARDIOTENS registry showed how the degree of control increased from 40% in 1999 to 55% in 2009, representing a relative increase of 38.50%. In the CARDIOTENS study, lack of blood pressure control was associated with lifestyle and diet-related factors, specifically obesity and smoking, both of which were associated with worse control. The data from our study are more in agreement with those obtained in the Cardiotens study. In a Peruvian study, 53.80% of hypertensive patients showed blood pressure figures within normal values[49].

The fact that the 'poor control' factor is based on a single measurement of blood pressure may have resulted in an overestimation of prevalence and an underestimation of control in some studies[50].

The degree of control in people already being treated is difficult to improve. Despite the existence of treatments that have proven to be very effective and efficient, therapeutic objectives are not met in the 50% of the cases. On the one hand, there is the possibility of influencing on the so-called "therapeutic inertia", and with the change or prescription of combined therapy as soon as necessary, proving that the patient tolerate it. On the other hand, through health education it is necessary to influence greater therapeutic adherence, probably an important pillar for improving the data obtained in this study[51-53].

An Ecuadorian study[54] showed that the prevalence of obesity determined by BMI was 27.70% among hypertensive patients, which coincides with a study carried out in Costa Rica[55] showing a prevalence of 30%. In our study the prevalence of obesity was much higher than that obtained in these studies.

### *Limitations of the study*

The study was carried out in the working and non-working population, aged between 18 and 70 years, and in specific geographical areas, so it cannot be extrapolated to the general population and to the entire national territory.

### *Strengths of the study*

The sample size is very large, one of the largest carried out to date. In addition, it should be noted that the population has been segregated according to possible comorbidities and, in addition, not only blood pressure but also many scales related to cardiovascular risk have been taken into account to assess the usefulness of pharmacological treatments.

## Conflict of interests

The authors have no conflict of interest.

## Bibliography

1. Dahlöf B, Lindholm LH, Hansson L, Schersten B, Ekbom T, Wester PO. Morbidity and mortality in the Swedish Trial in Old Patients with Hypertension (STOP-Hypertension). Lancet 1991;338:1281-5

2. Wikstrand J, Warnold I, Tuomilehto J, Olson G, Barber HJ, Eliasson K et al. Metoprolol versus thiazide diuretics in hypertension. Morbidity results from the MAPHY study.. Hypertension 1991; 17:579-88

3. Yusuf S, Peto R, Lewis J, Collins R, Sleight P. Beta blockade during and after myocardial infarction: an overview of the randomized trials. Prog Cardiovasc Dis 1985;17:335-71

4. Packer M, Bristow MR, Cohn JN, Colucci WS, Fowler MB, Gilbert EM et al. The effect of carvedilol on morbidity and mortality in patients with chronic heart failure. U.S. Carvedilol Heart Failure Study Group..N Engl J Med 1996;334:1349-55

5. Hansson L, Zanchetti A, Carruthers. Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. HOT Study Group. Lancet 1998; 351: 1755-62

6. Estacio RO, Jeffers BW, Hiatt WR, Biggerstaff SL, Giffard N, Schriew RW. The effect of nisoldipine as compared with enalapril on cardiovascular outcomes in patients with non-insulin-dependent diabetes and hypertension. N Engl J Med 1998;338:645-52

7. Salas-Salvadó J, Rubio MA, Barbany M, Moreno B. Grupo Colaborativo de la SEEDO. Consenso SEEDO 2007 para la evaluación del sobrepeso y la obesidad y el establecimiento de criterios de intervención terapéutica. Med Clin (Barc) 2007;128(5):184-96.

8. Gomez-Ambrosi J, Silva C, Catalan V, Rodriguez A, Galofre JC, Escalada J, et al. Clinical usefulness of a new equation for estimating body fat. Diabetes Care. 2012;35:383-8

9. Molina-Luque R, Romero-Saldaña M, Álvarez-Fernández C, Bennasar-Veny M, Álvarez-López Á, Molina-Recio G. Equation Córdoba: A Simplified Method for Estimation of Body Fat (ECORE-BF). Int J Environ Res Public Health. 2019 Nov 15;16(22):4529.

10. Woolcott, OO, Bergman RN. Defining cutoffs to diagnose obesity using the relative fat mass (RFM): Association with mortality in NHANES 1999–2014. Int J Obes 2020; 44, 1301-10.

11. Mill-Ferreyra E, Cameno-Carrillo V, Saúl-Gordo H, Camí-Lavado MC.Estimation of the percentage of body fat based on the body mass index and the abdominal circumference: Palafolls Formula.Semergen. 2019 Mar;45(2):101-8.

12. Deurenberg P, Wetstrate JA, Seidell JC. Body mass index as a measure of body fatness: age- and sex- specific prediction formulas. Br J Nutr 1991; 65: 105-14.

13. Chang Y, Guo X, Chen Y Guo L, Li Z, Yu S et al. A body shape index and body roundness index: two new body indices to identify diabetes mellitus among rural populations in northeast China. BMC Public Health 2015;15, 794.

14. Amato MC , Giordano C, Galia M, Criscimanna A, Vitabile S, Midiri M, et al. Visceral Adiposity Index: a reliable indicator of visceral fat function associated with cardiometabolic risk. Diabetes Care. 2010;33(4):920

15. Doménech-Asensi G, Gómez-Gallego C, Ros-Berruezo G, García-Alonso FJ, Canteras-Jordana M. Critical overview of current anthropometric methods in comparison with a new index to make early detection of overweight in Spanish university students: the normalized weight-adjusted index. Nutr Hosp 2018;35:359-67

16. Mancia, G (coord.) Grupo de Trabajo para el manejo de la hipertensión arterial de la Sociedad Europea de Hipertensión (ESH) y la Sociedad Europea de Cardiología (ESC). Guía de práctica clínica de la ESH/ESC para el manejo de la hipertensión arterial 2013. Hipertens riesgo vasc. 2013;30(l 3):1.

17. Díaz Rodríguez A, Millán Núñez-Cortés J (Coords.). Atención conjunta al paciente dislipémico. Documento de Consenso SEMERGEN-SEEN-SEA; 2010.

18. Orgaz Morales MT, Hijano Villegas S, Martínez Llamas MS, López Barba J, Díaz Portillo J. Guía del paciente con trastornos lipídicos. Madrid: Ministerio de Sanidad y Consumo. Instituto Nacional de Gestión Sanitaria; 2007.

19. National Cholesterol Education Program (NCEP). Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel lll). Third Report of the National Cholesterol Education Program (NCEP). Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel lll) final report. Circulation 2002;106(25):3143-51.

20. Zimmet P, Alberti G, Sahw J. Nueva definición mundial de la FID del síndrome metabólico: argumentos y resultados. Diabetes Voice 2005 Sep;50(3):31-3.

21. Cabrera-Rode E, Stusser B, Calix W, Orlandi N, Rodriguez J, Cubas-Dueñas I, et al. Concordancia diagnóstica entre siete definiciones de síndrome metabólico en adultos con sobrepeso y obesidad. Rev Peru Med Exp Salud Publica 2017;34(19:19-27

22. Marrugat J, Solanas P, D´Agostino, Sullivan L, Ordovas J, Cordón F, et al. Estimación del riesgo coronario en España mediante la ecuación de Framingham calibrada. Rev Esp Cardiol. 2003;56(3):253-61.

23. Aranceta J, Pérez Rodrigo C, Foz Sala M, Mantilla T, Serra Majem L, Moreno B et al. Grupo Colaborativo para el estudio DORICA fase ll. Tablas de evaluación del riesgo coronario adaptadas a la población española. Estudio DORICA. Med Clin (Barc) 2004;123(18):686-91.

24. Conroy R, Pyörälä K, Fitzgerald T, Sans S, Menotti A, De Backer G, et al. Estimation of ten-year risk of fatal CVD in Europe: the SCORE Project. Eur Heart J 2003;24(11):987-1003.

25. Sans S, Fitzgerald AP, Royo D, Conroy R, Graham I. Calibración de la tabla SCORE de riesgo cardiovascular para España. Rev Esp Cardiol 2007;60(5):476-85.

26. Buitrago F, Cañón Barroso L, Díaz Herrera N, Cruces Muro E, Escobar Fernández M, Serrano Arias JM. Comparación de las tablas REGICOR y SCORE para la clasificación del riesgo cardiovascular y la identificación de pacientes candidatos a tratamiento hipolipemiante o antihipertensivo. Rev Esp Cardiol 2007;60(2):139-47.

27. Gabriel R, Brotons C, Tormo MJ, Segura A, Rigo F, Elosua R, et al. La ecuación ERICE: la nueva ecuación autóctona de riesgo cardiovascular para una población mediterránea envejecida y de bajo riesgo en España. Rev Esp Cardiol 2015;68:205-15

28. Wilson WF, D'Agostino RD, Levy D, Belanger AM, Silbershatz H, Kannel WB. Prediction of coronary heart disease using risk factor categories. Circulation. 1998;97(18):1837-47.

29. D'Agostino RB Sr, Vasan RS, Pencina MJ, Wolf PA, Cobain M, Massaro JM, Kannel WB. et al. General cardiovascular risk profile for use I primary care. The Framingham heart study. Circulation. 2008;117(6):743-53.

30. Cuende JI. Vascular Age, RR, ALLY, RALLY and Vascular Speed, Based on SCORE: Relations Between New Concepts of Cardiovascular Prevention. Rev Esp Cardiol (Engl Ed). 2018;71(5):399-400.

31. Bedogni G, Bellentani S Miglioli L, Masutti F, Passalacqua M, Castiglione A, et al. The Fatty Liver Index: a simple and accurate predictor of hepatic steatosis in the general population. BMC Gastroenterol. 2006 2;6:33

32. Lee JH, Kim D, Kim JH, Lee CH, Yang JI, Kim W, et al. Hepatic steatosis index: a simple screening tool reflecting nonalcoholic fatty liver disease. Dig Liver Dis. 2010 Jul;42(7):503-8.

33. Wang J, Xu Ch, Xun Y, Lu Z, Shi J, Yu C, et al. ZJU index: a novel model for predicting nonalcoholic fatty liver disease in Chinese population. Scientific Reports 2015;5:16494

34. Long MT, Pedley A, Colantonio LD, Massaro JM, Hoffman U, Muntner P, et al. Development and validation of the Framingam Steatosis Index to identify persons with hepatic steatosis. Clin Gastroenterol Hepatol 2016;14(8):1172-80

35. Biyik Z, Guney I. Lipid accumulation product and visceral adiposity ındex: two new indices to predict metabolic syndrome in chronic kidney disease. Eur Rev Med Pharmacol Sci. 2019 Mar;23(5):2167-2173

36. Yan Z, Yu D, Cai Y, Shang J, Qin R, Xiao J, et al. Triglyceride Glucose Index Predicting Cardiovascular Mortality in Chinese Initiating Peritoneal Dialysis: A Cohort Study. Kidney Blood Press Res. 2019;44(4):669-78.

37. RF. Yang, X.-Y. Liu, Z. Lin, G. Zhang. Correlation study on waist circumference-triglyceride (WT) index and coronary artery scores in patients with coronary heart disease. Eur Rev Med Pharmacol Sci 2015; 19 (1): 113-118

38. Unger G, Benozzi SF, Peruzza F, Pennacchiotti GL. Triglycerides and glucose index: A useful indicator of insulin resistance. Endocrinol Nutr. 2014;61(10):533-40

39. Zheng S, Shi S, Ren X, Han T, Li Y, Chen Y, et al. Triglyceride glucosa waist circumference, a novel and effective predictor of diabetes in first-degree relatives of type 2 diabetes patients: cross-sectional and prospective cohort study. Journal of translational medicine. 2016; 14(1):260.

40. Wakabayashi I, Daimon T. The "cardiometabolic index" as a new marker determined by adiposity and blood lipids for discrimination of diabetes mellitus. ClinChim Acta. 2015;438:274-8.

41. Bestehorn K, Smolka W, Pittrow D, Schulte H, Assmann G. Atherogenic dyslipidemia as evidenced by the lipid triad: prevalence and associated risk in statin-treated patients in ambulatory care. Curr Med Res Opin 2010; 26:2833-9

42. Monllor B, Pérez MA, Reig J, Amigó M, Cebrián S, Sala M, et al. Estudio Piloto del grado de control de la presión arterial en pacientes tratados con fármacos antihipertensivos. Farmacéuticos Comunitarios 2020;12(Supl 2º Congreso Semergen SEFAC):81

43. Ortiz Marrón H, Vaamonde Martín RJ., Zorrilla Torrás B, Arrieta Blanco F, Casado López M, Medrano Albero MJ. Prevalencia, grado de control y tratamiento de la hipertensión arterial en la población de 30 a 74 años de la Comunidad de Madrid: Estudio PREDIMERC. Rev. Esp. Salud Publica 2011;85( 4 ): 329-38.

44. Kronborg CN, Hallas J, Jacobsen IA. Prevalence, awareness, and control of arterial hypertension in Denmark. J Am Soc Hypertens. 2009;3:19-24.

45. Wolf-Maier K, Cooper RS, Kramer H, Banegas JR, Giampaoli S, Joffres MR, et al. Hypertension treatment and control in five european countries, Canada and the United States. Hypertension. 2004;43:10-7.

46. Menéndez E, Delgado E, Fernández-Vega F, Prieto MA, Bordiú E, Calle A, et al. Prevalence, Diagnosis, Treatment, and Control of Hypertension in Spain. Results of the Di@bet.es Study. Rev Esp Cardiol. 2016;69(6):572-8.

47. Barrios V, Escobar C, Alonso-Moreno FJ, Prieto MA, Pallares V, Rodríguez-Roca G, Llisterri JL; Working Group of Arterial Hypertension of the Spanish Society of Primary Care Physicians (Group HTASEMERGEN), the PRESCAP 2010 investigators. Evolution of clinical profile, treatment and blood pressure control in treated hypertensive patients according to the sex from 2002 to 2010 in Spain. J Hypertens. 2015;33(5):1098-107.

48. Cordero A, Bertomeu-Martínez V, Mazón P, Fácila L, Bertomeu-González V, Cosín J, Galve E, Núñez J, Lekuona I, González-Juanatey JR. Factores asociados a la falta de control de la hipertensión arterial en pacientes con y sin enfermedad cardiovascular. Rev Esp Cardiol. 2011;64(7):587-93.

49. Arana Morales G, Cilliani Aguirre B, Abanto D. Cumplimiento del tratamiento farmacológico y control de la presión arterial en pacientes del programa de hipertensión: Hospital Víctor Lazarte Echegaray-EsSALUD, Trujillo. Rev Med Hered 2001; 12 (4), 120-1

50. Klungel OH, de Boer A, Paes AHP, Nagelkerke NJD, Seidell JC, Bakker A. Influence of Correction for Within-Person Variability in Blood Pressure on the Prevalence, Awareness, Treatment, and Control of Hypertension. Am J Hypertens. 2000;13:88-91.

51. Alonso-Moreno FJ, Llisterri-Caro JL, Rodríguez-Roca GC, Ferreiro-Madueño M, González-Segura-Alsina D, Divisón-Garrote JA, et al. Conducta del médico de Atención Primaria ante el mal control de los pacientes hipertensos. Estudio PRESCAP 2006. Rev Clín Esp. 2008;208:393-9.

52. Márquez-Contreras E, de Rivas-Otero B, Divison-Garrote JA, Sobreviela-Blázquez E, Luque-Otero M. ¿Evaluamos y controlamos adecuadamente a los hipertensos atendidos en atención primaria? Estudio HICAP. An Med Interna. 2007;24:312-6.

53. Comité de redacción de la Sociedad Española de Hipertensión-Liga Española para la Lucha contra la Hipertensión Arterial. Guía Española de Hipertensión Arterial 2005. Capitulo VIII: Tratamiento farmacológico. Hipertensión. 2005;22(supl 2):47-57.

54. De la Rosa Ferrera JM, Acosta Silva M. Possible cardiovascular risk factors in patients with arterial hypertension in three neighbourhoods from Esmeraldas, Ecuador. Rev. Arch Med Camagüey 2017;21(3):361-9

55. Bogantes Pereria E, Chavarría Viquez J, Arguedas Bolaños D. Prevalencia de Obesidad en pacientes hipertensos en el Servicio de Cardiología del Hospital México de Costa Rica. Rev Costarr Cardiol. 2009;11(1):13-8.