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# Factors associated with arterial hypertension in pharmacy users in Portugal

## ABSTRACT

**OBJECTIVE:** To estimate the prevalence, treatment and control of hypertension, and to identify factors associated in community pharmacy users.

**METHODS:** A cross-sectional study was conducted with 1,042 pharmacy users, aged between 40 and 65 years, in 60 community pharmacies of continental Portugal, between October 2005 and January 2006. Data were obtained with the application of a questionnaire and measurement of biological parameters. A total of three sequential logistic regressions were performed to verify an association among variables.

**RESULTS:** Mean age was 53.7 years and the male/female ratio was 0.68. Prevalence of arterial hypertension was 54.8%. Approximately 70% of hypertensive individuals were undergoing antihypertensive treatment and, of these, 47.7% were controlled. Hypertension was positively associated with older age, male sex, being married, higher body mass index and higher total cholesterol level, being a diabetic, having a family or personal history of premature cardiovascular disease, and reporting more medical visits per year. When treated, hypertension was found to be positively associated with the female sex, not being married, being a diabetic, living in an urban area, and reporting more than three medical visits per year. In hypertensive users who were treated, being controlled was positively associated with self-reporting adherent behavior towards antihypertensive treatment, perceiving the effect of these drugs and having a low cardiovascular risk. The predictive models showed areas under the respective ROC curves between 0.72 and 0.78, with an acceptable discriminatory power.

**CONCLUSIONS:** The prevalence of hypertension was high, although similar to that found in other studies conducted in Portugal. The proportion of hypertensive individuals under treatment was satisfactory, in contrast to an insufficient level of control.

**DESCRIPTORS: Hypertension, epidemiology. Pharmacies, utilization. Risk Factors. Cross-Sectional Studies.**

## INTRODUCTION

Arterial hypertension (AHT) is a well-established risk factor for cardiovascular diseases (CVD). It is estimated that this disease is responsible for approximately 7.1 million premature deaths worldwide[17] and that it contributes to the appearance of 62% of cerebrovascular diseases and 49% of ischemic heart disease cases.[20]

The rate of mortality from cerebrovascular accidents (CVA) and ischemic heart disease has decreased substantially and consistently throughout the last 30

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years in the United States, Japan and several Western European countries. Antihypertensive pharmacological treatment has played a relevant role in the positive evolution of CVD.[11]

However, studies confirm that the percentage of treatment and control of hypertensive individuals is far from what is expected, even in developed countries.[8,16]

Hypertension also has a high prevalence in Portugal, affecting more than 40% of the adult population. The study known as "Prevalence, Awareness, Treatment and Control of Hypertension in Portugal" (PAP study), conducted nationwide in 2003, identified 42.1% of hypertensive individuals in the adult population surveyed (aged between 18 and 90 years); 46.1% of whom were aware of their condition; 39.0% were under treatment; and 11.2% were controlled. These values are low, especially in terms of control of hypertension.[13]

Statistics in Portugal show that morbidity and mortality from myocardial infarction in this country are among the lowest ones in Western Europe, although the rate of mortality from CVA is one of the highest worldwide.[3,14]

In view of the fact that one of the most important risk factors for CVA is hypertension, particularly when it is not diagnosed or adequately and prematurely treated and controlled, the identification and evaluation of the impact of predictors of prevalence, treatment and control of hypertension become relevant and urgent. This would enable intervention policies, focused on the population groups that most need intervention, to be designed and more effective results to be achieved.

The present study aimed to estimate the prevalence, treatment and control of hypertension and to identify associated factors.

## METHODS

An observational, descriptive and cross-sectional study was conducted with a sample of users of 60 pharmacies from the five health areas of Portugal (North, Center, Lisboa and Vale do Tejo, Alentejo and Algarve), between October 2005 and January 2006. The distribution of pharmacies considered the percentage of the urban/rural population existing in their respective areas.

The sample was classified into two groups: urban population (residing in average/predominantly urban districts) or rural population (residing in predominantly rural districts), according to the Instituto Nacional de Estatística.

Each pharmacy should select two users per day, during ten days (the first one between 11:00am and 1:00pm and the second one between 4:00pm and 6:00pm), totaling 20 users. The criteria of inclusion were as follows: to be aged between 40 and 65 years, to understand Portuguese and not to show signs of cognitive or mental disabilities. In addition, the responsible pharmacist should participate in a qualification course to be included in the study.

Structured questionnaires were applied, including sociodemographic, behavioral, clinical and therapeutic variables, and the users' total cholesterol, arterial pressure, weight and height were measured.

Arterial pressure (AP) was measured after five minutes of sitting rest, two times (interval of three minutes) and the mean value of both measurements was considered.[a] The measuring instruments used were semi-automatic, clinically validated and included an armband that could be adjusted to the arm circumference.

Individuals who showed an AP ≥140/90 mmHg (or ≥130/80mmHg in diabetics) were considered to be hypertensive (HT), in addition to those who were taking antihypertensive drugs.[20]

Individuals undergoing antihypertensive pharmacological treatment were considered treated hypertensive (THT) users, while those undergoing pharmacological treatment, with an AP <140/90mmHg (or <130/80mmHg in diabetics), were considered controlled hypertensive (CHT) users.

Capillary blood samples were collected to obtain the total cholesterol value, using the Accutrend® GC. Individuals were considered to have hypercholesterolemia if their total cholesterol value was >190mg/ml or if they were taking hypolipidemic drugs. Individuals using antidiabetic drugs were considered diabetic.

Body mass índex (BMI) was calculated, based on users' weight and height, measured barefoot, in the pharmacies.

A total of two classes of smoking habits were taken into consideration: smokers and non-smokers.

Calculation of global cardiovascular risk was performed using the Score® table for low-risk countries, in which Portugal is included.[2,5]

The sample was calculated according to estimates of the population residing in Continental Portugal (aged between 40 and 65 years), published by the Instituto Nacional de Estatística (2001), considering a prevalence of the phenomenon (hypertension) in the age group studied of 55%,[13] accuracy of 3%, and 95% confidence

[a] Ministério da Saúde, Direcção Geral da Saúde. Circular Normativa de 31/03/2004 - Diagnóstico, tratamento e controlo da hipertensão arterial. Lisboa; 2004.

interval (95%CI). The sample size was estimated to be 1,056 individuals, using the following formula: $N = 4z\alpha^2P(1-P)+ W^2$, where $z\alpha$ corresponds to the expected level of confidence; P, the estimated prevalence; and W, the error interval.

Statistical analysis was performed with the SPSS (v15) and R-CRAN software programs. Absolute and relative frequencies, proportions, location and dispersion measurements were described for all variables.

The sample was dichotomized according to the presence of HT, THT and CHT. The study of predictors of THT only included HT individuals (571 users). THT individuals (400 users) were considered as predictors of CHT.

Bivariate analyses were performed, using the $\chi^2$ test and Fisher's exact test for categorical variables, while Student's t-test was used for quantitative variables. Logistic regression was used to identify risk factors for HT, THT and CHT. This technique initially consists in the evaluation of the univariate association between each variable and the response variable (HT, THT, CHT). This evaluation was made using the Wald test, with a significance level of 20% ($p<20\%$). The multivariate logistic regression model was adjusted with the stepwise selection process to obtain the best model. The significance level for tests was lower than 5% for the entry of a new variable, and more than 15% for its removal.

A goodness-of-fit test (Hosmer-Lemeshow) for each of the results observed was performed to validate the final logistic regression models. ROC curves (Receiving Operating Curves) were generated to evaluate the discriminatory power of models.

A level of significance of $p<0.05$ and 95%CI were adopted.

Figure 1 shows the three sequential logistic regressions (HT, THT and CHT) performed.

The informed consent form was obtained from participants, in accordance with the Declaration of Helsinki, although questionnaires were anonymous. This study was approved by the Ethics Committee of the Faculdade de Farmácia da Universidade de Lisboa, on March 21, 2005.

## RESULTS

The sample was comprised of 1,042 individuals, with a mean age of 53.7 years (standard deviation, SD =7.1), of which 59.4% were women. A total of 98.7% of the expected sample was obtained (1,042/1,056), and 14 questionnaires were considered invalid because they did not have information about the essential variables.

The social and health characteristics of the individuals studied are shown in Table 1.

More than half of the sample was hypertensive (54.8%), 63.1% had hypercholesterolemia, almost 30% were obese, approximately 13% were diabetic and 16% were smokers.

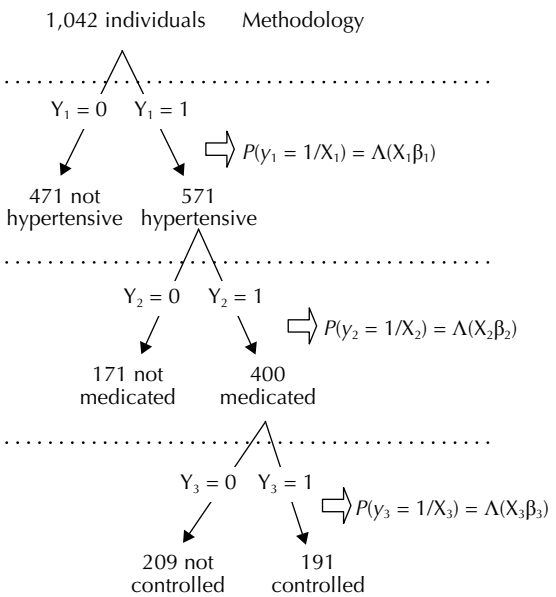
Prevalence of hypertension in the sample was 54.8%, with a higher frequency in men (61.0%) than women (50.6%).

Mean values of systolic and diastolic arterial pressure were 134.77 (95%CI 133.58;135.97; SD=19.7) and 81.02 (95%CI 80.33;81.72; SD=11.4), respectively.

Mean age of HT pharmacy users was 55.49 years, while that of non-hypertensive users was 51.50 years ($p<0.001$).

Prevalence of hypertension was significantly higher in men ($p<0.01$), increasing with age. This prevalence seemed not to be associated with the fact of one living in an urban or rural area, although it was more frequent in individuals with a lower level of education and those who were married.

Hypertension was also frequent in professionally inactive individuals, diabetics, obese, those with




$y_i$,i = binary variable with y1=1 if the individual is hypertensive
$y_2 = 1$ if their hypertension is treated
$y_3 = 1$ if their hypertension is controlled
$X_i$,i = 1,2,3 set of predictors associated with $y_i$,
$y_i \beta_i$ = parameters
$\Lambda$ = logistic regression function

**Figure 1.** Sequential logistic regression models. Portugal, 2005-2006.

**Table 1.** Community pharmacy users, according to social and health co-variables. Portugal, 2005-2006. (N=1,042)

| Variable | n | % |
|---|---|---|
| Sex | | |
| Female | 619 | 59.4 |
| Male | 423 | 40.6 |
| Age group (years) | | |
| 40 to 49 | 321 | 30.7 |
| 50 to 59 | 463 | 44.5 |
| 60 to 65 | 258 | 24.8 |
| Health area | | |
| North | 236 | 22.6 |
| Center | 181 | 17.4 |
| Lisboa and Vale do Tejo | 197 | 18.9 |
| Alentejo | 220 | 21.2 |
| Algarve | 208 | 20.0 |
| Place of residence | | |
| Urban | 790 | 75.8 |
| Rural | 252 | 24.2 |
| Marital status | | |
| Married / cohabiting | 864 | 83.2 |
| Single / divorced / widowed | 174 | 16.8 |
| Level of education (years) | | |
| < 4 | 89 | 8.5 |
| 4 to 11 | 515 | 49.4 |
| 12 | 333 | 32.0 |
| > 12 | 104 | 10.1 |
| Employment status | | |
| Employed | 599 | 57.5 |
| Unemployed | 45 | 4.3 |
| Retired | 218 | 20.9 |
| Housewife | 180 | 17.3 |
| Self-reported health status | | |
| Very good | 33 | 3.2 |
| Good | 363 | 34.9 |
| Fair | 538 | 51.8 |
| Poor/very poor | 106 | 10.2 |
| Number of visits to doctors in the previous year | | |
| None | 121 | 11.7 |
| 1 to 3 | 559 | 54.1 |
| More than 3 | 355 | 34.3 |
| Comorbidities (except cardiovascular diseases) | | |
| No | 514 | 49.4 |
| Yes | 528 | 50.6 |

hypercholesterolemia and those who had a family or personal history of premature cardiovascular disease ($p<0.05$). This phenomenon was not observed in smokers, and the prevalence of hypertension was higher in non-smokers.

Of all HT users, 70% (400/571) were taking hypertensive drugs.

The prevalence of treated hypertension was higher in women ($p<0.05$), increasing with age. In addition, this prevalence was associated with living in an urban area ($p=0.001$), although not with the level of education or employment status; and it was more frequent in individuals who were not married (single, divorced or widowed).

Prevalence of treated hypertension was higher in diabetics, those with a personal history of cardiovascular diseases ($p<0.05$) and non-smokers. THT individuals reported a higher number of visits to doctors per year than those who had not been treated ($p<0.05$).

When undergoing an antihypertensive treatment, 47.7% (191/400) of HT individuals were controlled.

The prevalence of controlled hypertension, when compared to that of uncontrolled hypertension, did not show statistically significant differences in any of the following variables: sex, age, urban or rural place of residence, level of education, employment status, marital status, personal or family history of premature CVD and smoking habit ($p>0.05$).

Prevalence of uncontrolled hypertension was higher in diabetics and individuals with high cardiovascular risk.

CHT individuals reported a higher number of visits to doctors per year, compared to uncontrolled ones ($p<0.05$). In addition, 52.8% of CHT individuals reported at least three medical visits in the previous year.

After adjustment, the presence of hypertension was positively associated with higher age, male sex, being married, higher BMI, higher total cholesterol levels, being a diabetic, having a family or personal history of premature CVD and reporting a higher number of medical visits per year. On the other hand, the presence of hypertension was negatively associated with smoking habits and it was less frequent in smokers (Table 2).

The goodness-of-fit test of this model showed $\chi^2=5.62$ ($p=0.69$ through the Hosmer & Lemeshow test), i.e., there were no statistically significant differences between values adjusted through the model and actual values.

The ROC curve for the hypertension model showed an area under the curve of 0.78 (95%CI 0.75;0.81),

**Table 2.** Factors associated with hypertension in community pharmacy users. Portugal, 2005-2006.

| Variable | Univariate analysis (n=1,042) | | | Multivariate analysis (n=1,042) | | |
|---|---|---|---|---|---|---|
| | OR | p | 95%CI | OR | p | 95%CI |
| Age (in groups of ten years) | 2.30 | 0.000 | 1.913;2.764 | 1.92 | 0.000 | 1.553;2.384 |
| Male sex | 1.53 | 0.001 | 1.189;1.965 | 1.76 | 0.000 | 1.293;2.386 |
| Married | 1.50 | 0.016 | 1.080;2.076 | 1.47 | 0.045 | 1.009;2.143 |
| BMI (per unit) | 1.17 | 0.000 | 1.136;1.214 | 1.13 | 0.000 | 1.089;1.168 |
| Smoker | 0.44 | 0.000 | 0.317;0.625 | 0.64 | 0.034 | 0.427;0.966 |
| Diabetic | 4.70 | 0.000 | 2.969;7.431 | 2.45 | 0.000 | 1.485;4.054 |
| Hypercholesterolemia | 1.52 | 0.001 | 1.183;1.964 | 1.38 | 0.035 | 1.023;1.851 |
| 1 to 3 medical visits per year | 0.66 | 0.001 | 0.516;0.846 | 1.59 | 0.040 | 1.021;2.480 |
| > 3 medical visits per year | 2.38 | 0.000 | 1.820;3.122 | 2.32 | 0.001 | 1.424;3.782 |
| CVD | 3.72 | 0.000 | 2.374;5.836 | 2.43 | 0.000 | 1.485;3.985 |
| Family history of premature CVD | 1.80 | 0.004 | 1.205;2.703 | 2.04 | 0.003 | 1.271;3.287 |

BMI: Body mass index; CVD: Cardiovascular disease

which means that this model correctly estimates the probability of being HT as higher than the probability of not being HT in 78% of pairs (being HT and not being HT) (Figure 2).

The estimates that can be obtained from this model are examples of how this can contribute to the analysis under an individual perspective, based on a risk profile survey.

According to the model obtained, a woman who is aged 60 years, married, not diabetic, and non-smoker, who does not have hypercholesterolemia or a family or personal history of CVD, and who has a BMI=25 kg/m$^2$ shows a probability of being hypertensive of 50.5%. In case this estimate is analyzed with the same characteristics, except for the fact that this woman becomes diabetic, the probability of being hypertensive increases by 23%.

To be treated for HT was positively associated with being a woman, not being married, being a diabetic, living in an urban area and reporting more than three medical visits per year (Table 3).

The goodness-of-fit test for this model showed $\chi^2$=11.05 (p=0.20 through the Hosmer & Lemeshow test). In addition, according to this model, there were statistically significant differences between adjusted values and actual values.

The ROC curve for the "treated hypertensive" model showed an area under the curve of 0.72 (95%CI 0.68;0.77).

**Table 3.** Factors associated with treated hypertension in community pharmacy users. Portugal, 2005-2006.

| Variable | Univariate analysis (n=571) | | | Multivariate analysis (n=571) | | |
|---|---|---|---|---|---|---|
| | OR | p | 95%CI | OR | p | 95%CI |
| Age (in groups of ten years) | 1.53 | 0.002 | 1.165;1.999 | 1.27 | 0.119 | 0.941;1.703 |
| Male sex | 0.59 | 0.004 | 0.411;0.845 | 0.64 | 0.033 | 0.426;0.966 |
| Married | 0.48 | 0.017 | 0.268;0.877 | 0.51 | 0.041 | 0.273;0.972 |
| Obesity | 1.06 | 0.007 | 1.016;1.105 | 1.04 | 0.103 | 0.992;1.089 |
| Smoker | 0.47 | 0.005 | 0.277;0.797 | 0.59 | 0.087 | 0.318;1.081 |
| Diabetic | 1.81 | 0.018 | 1.108;2.956 | 1.80 | 0.040 | 1.028;3.137 |
| Hypercholesterolemia | 1.48 | 0.039 | 1.020;2.160 | 1.36 | 0.145 | 0.899;2.065 |
| 1 to 3 medical visits per year | 0.72 | 0.080 | 0.505;1.040 | 1.94 | 0.059 | 0.975;3.862 |
| > 3 medical visits per year | 2.16 | 0.000 | 1.471;3.162 | 2.93 | 0.004 | 1.401;6.126 |
| CVD | 2.44 | 0.002 | 1.403;4.259 | 1.80 | 0.052 | 0.994;3.267 |
| Family history of premature CVD | 1.73 | 0.006 | 1.168;2.553 | 1.53 | 0.050 | 0.999;2.342 |
| Residing in rural area | 0.51 | 0.001 | 0.344;0.753 | 0.46 | 0.001 | 0.301;0.719 |

CVD: Cardiovascular disease

With regard to the univariate evaluation, there were no significant predictors for the regression model whose outcome was CHT.

The following variables, related with the antihypertensive treatment, were included in the analysis: number of drugs taken, number of active substances, ATC groups of active substances, number of daily doses, duration of treatment, self-reported adherence to treatment, reporting adverse drug effects, and perception of the effect of antihypertensive treatment.

A new evaluation of the univariate association between the variables studied and the response variable was performed, followed by the adjustment of the multivariate logistic regression model.

Control of hypertension in medicated individuals was positively associated with the fact that those who were ill reported adherence to treatment, stated that they perceived the effect of the drug and had a low cardiovascular risk, according to the Score® model for Portugal (Table 4).

The goodness-of-fit test in this model showed $\chi^2$=6.98 (p=0.54 through the Hosmer & Lemeshow test) and it was adequate for the sample observed.

The ROC curve for the "to be controlled if treated" model showed an area under the curve of 0.77 (95%CI 0.72;0.82).

## DISCUSSION

Hypertension was a frequent clinical situation in the sample of this study (54.8%), the majority of HT individuals were taking drugs (70%) and almost half of the THT individuals were controlled (47.8%). The proportion of THT and CHT in this study was higher than that found in other studies conducted in the Portuguese population, although the prevalence of hypertension was similar in the age groups studied (between 40 and 65 years).[12,13]

The results of the present study, which are in agreement with those shown by other authors, suggest that the prevalence of hypertension in Portugal is lower than that observed in other developed countries, namely the USA, Canada, Spain, the United Kingdom and Switzerland.[9]

The proportion of treatment in HT individuals was high in the present study (70%). This fact is probably associated with the place of study, the community pharmacy. In effect, in the PAP study (2003), a nationwide study in which one of the objectives was to evaluate the prevalence of THT as well, this percentage was 39%; in addition, 28.7% of THT individuals had controlled arterial pressure values.[6] Another study (2000), conducted in the city of Porto and involving the adult population aged more than 40 years, reported a proportion of HT individuals taking antihypertensive drugs of 46.9%.[12]

The proportion of CHT, if treated, was also higher than the proportion found in the PAP study (47.8% versus 28.7%); however, this is in accordance with the rule of

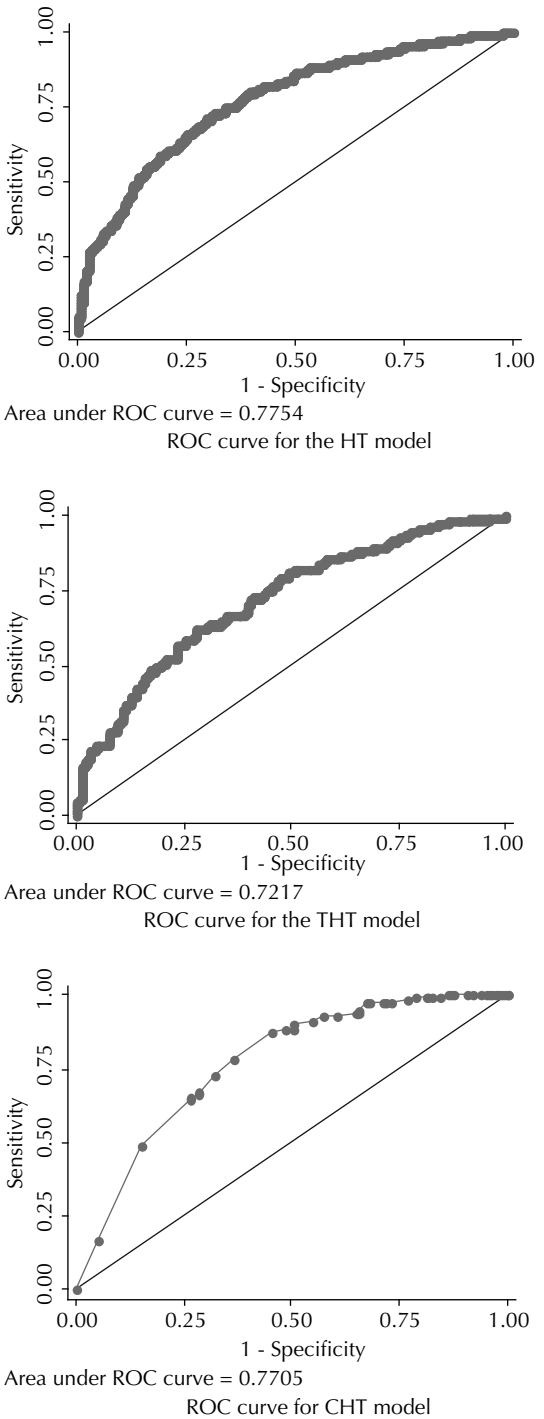



**Figure 2.** ROC curves for hypertension, treated hypertension and controlled hypertension (if treated) in community pharmacy users. Portugal, 2005-2006.

**Table 4.** Factors associated with controlled hypertension (if treated) in community pharmacy users. Portugal, 2005-2006.

| Variable | Univariate analysis (n=400) | | | Multivariate analysis (n=400) | | |
|---|---|---|---|---|---|---|
| | OR | p | 95%CI | OR | p | 95%CI |
| Adherence to AHT treatment | 2.279 | 0.003 | 1.316;3.945 | 2.250 | 0.009 | 1.175;4.307 |
| Perception of the effect of AHT treatment | 5.862 | 0.000 | 3.171;10.837 | 4.832 | 0.000 | 2.498;9.349 |
| High global CVD risk | 0.690 | 0.000 | 0.612;0.779 | 0.680 | 0.000 | 0.593;0.787 |

AHT: Arterial hypertension; CVD: Cardiovascular disease

halves, as observed in the majority of developed countries in general: approximately half of THT individuals have controlled arterial pressure levels.[16]

The use of semi-automatic devices to measure arterial pressure in this study increases the validity of measurements and prevents a phenomenon known as "end-digit-preference", described as a trend towards rounding up the values obtained to a zero decimal or multiples of five, creating clusters of arterial pressure measurements, especially around the 140/90 mmHg values.[1]

The results showed a high prevalence of other cardiovascular risk factors, namely hypercholesterolemia (63.1%), obesity (29%) and diabetes (12.5%). These proportions are similar to those observed in other Portuguese studies, in the same age group (40-65 years): Costa[4] (2003) found a national prevalence of hypercholesterolemia of 63.8% and Santos & Barros[15] (2003) found a prevalence of obesity of 28.8% in the 40-to-69 -year age group. Based on these data, the results of the present study seem to be consistent with those observed in the Portuguese population. However, the possibility of selection bias should be considered, because, due to the recruitment method of pharmacies, the sample includes higher proportions of females and older age groups than those present in the Portuguese population.

Hypertension was positively associated with cardiovascular factors, such as age, male sex, presence of diabetes and hypercholesterolemia, and personal and family history of premature CVD.

HT was negatively associated with smoking habits. There were no explanations in the literature, although one hypothesis for this result is that being HT could lead one to quit one's smoking habits.

THT was especially associated with factors related to accessibility to health care (living in an urban area and having made a higher number of medical visits per year), but so were being a woman, being a diabetic and not being married/cohabiting.

Lack of control of arterial pressure values in THT was associated with the patient's characteristics: no adherence to treatment, lack of perception of the therapeutic effect of antihypertensive drugs, and having a low cardiovascular risk.

The existence of secondary effects, caused by antihypertensive treatment and detected by the patient, was not identified as a significant predictor ($p<0.05$) of lack of control of arterial pressure values in the model found in this study, although this would have been the case, if $p<0.10$ were considered.

Variables such as the type of antihypertensive drugs taken, the number of antihypertensive drugs taken, the number of daily doses and the total number of drugs chronically taken were analyzed, although they were not associated with lack of control of arterial pressure.

Sehestedt et al[17] (2007) identified the fact of being a diabetic or having CVD and having frequent contact with a general practitioner in the last 12 months as the main predictors of hypertension treatment in Denmark. An increase in BMI showed a significantly negative association with hypertensive individuals receiving treatment. In the study conducted by Sehestedt et al,[17] authors did not find statistically significant predictors of control of hypertension, given the fact that data on drug intake were not collected.[17]

Esposti et al[6] (2004) identified the following as predictors in Italy: the presence of diabetes mellitus, and the increase in the patient's and doctor's age. The number of other frequently taken drugs and previous history of myocardial infarction were considered as protective factors of lack of control. This study concluded that lack of control of hypertension when treatment is present is simultaneously associated with the characteristics of a patient and factors inherent to the relationship between this individual and their doctor.

Knight et al[10] (2001) identified, in the American population, a set of independent predictors of lack of arterial pressure control: increase in age, multiple therapeutic regimens, the patients' lack of knowledge about desirable systolic arterial pressure values, and reporting secondary effects associated with treatment.

In view of the results obtained in the present study and compared to the literature, it seems that predictors of control of treated AHT vary according to the country, probably because they are associated with the type of health system and medical care provided and should be studied on a national basis.

The ROC curves for the HT, THT or CHT models show areas under the curve between 0.72 and 0.78. This area is used as a measure of the discriminatory power of the tracking instrument, providing a global statistical summary of its diagnostic accuracy. The nearer to 1 the area is, the more accurate the instrument.[18]

According to Hosmer & Lemeshow (2000), an area between 0.70 and 0.80 represents an acceptable discriminatory power. It is possible to conclude that the three areas obtained for the HT, THT and CHT models have an acceptable discriminatory power.[7]

No studies that aimed to analyze the HT, THT and CHT predictors in Portugal were found by researchers of this study. However, it is believed that such knowledge is essential to enable the definition of public health strategies that are adequate to cardiovascular prevention, and which can help to identify target populations in need of medical care. This would allow the construction of a useful instrument to develop effective treatment strategies in specific sub-populations.

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