Control of hypertension in patients at high risk of cardiovascular disease

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Summary

Background: Hypertension is a major cardiovascular risk factor, but knowledge about the real magnitude of the problem and its determinants is lacking.

Aim: To assess control of hypertension and evaluate medical resource use, in patients at high risk of cardiovascular disease.

Design: Multicentric cross-sectional study.

Methods: We collected data for 2205 adult patients from 36 centres, representative of all regions of Spain. Patients had attended out-patient clinics from July 2002 to August 2003, had an absolute cardiovascular risk ≥20% at 10 years (according to the Framingham guidelines), and had a diagnosis of hypertension. Pregnant and terminally ill patients were excluded.

Results: Hypertension was inadequately controlled in 1384 patients (62.8%). LDL cholesterol was higher in patients with uncontrolled hypertension (median 130.2 vs. 120.0 mg/dl, p = 0.001). Haemoglobin A1c in diabetic patients was also greater in those with uncontrolled hypertension (median 7.10% vs. 6.90%, p = 0.010). Uncontrolled hypertension was associated with the following variables, in descending strength of association: higher LDL cholesterol, taking antihypertensive medication, living in non-metropolitan areas, and higher body mass index.

Discussion: Hypertension is poorly controlled in most patients with a high risk of cardiovascular disease. Uncontrolled hypertension is frequently associated with poor control of other risk factors.

Introduction

Cardiovascular disorders already constitute the main cause of premature disability and death in developed countries, and in years to come, may well become the leading global cause of disease. Numerous studies in different countries have demonstrated a clear link between cardiovascular disease and habits or conditions known as ‘risk factors’.1,2 Those factors may be grouped into three categories: (i) not modifiable (age, male gender, genetics); (ii) modifiable by lifestyle change (smoking, obesity, physical inactivity); and (iii) modifiable by pharmacotherapy and/or lifestyle change (lipid disorders, hypertension, insulin resistance). Other factors, such as infection or the level of homocysteine and lipoprotein (a) [Lp(a)], may also influence the development of cardiovascular disease, but their role remains controversial. Different risk factors tend to coincide in the same...
patients, which leads to a multiplicative pathogenic effect.3

Interventions directed at risk factor modification have had substantial success in reducing morbidity and mortality due to acute cardiovascular events in the last years. However, efforts are still needed to improve prevention and treatment of atherosclerosis, the underlying pathological process in most cardiovascular disease.4,5 In clinical practice, inadequate control of risk factors is frequently observed,6–8 although insufficient knowledge exists about the real magnitude of the problem and its determinants.

Hypertension, both systolic and diastolic, is a major cardiovascular risk factor. It is common, readily detectable, and treatable with pharmacotherapy and lifestyle modifications. Nevertheless, if left untreated, it often leads to lethal complications. In this study, in patients with high risk of cardiovascular disease, we assessed adequacy of control of hypertension, appraised medical resource use by patients with hypertension, and searched for factors associated with insufficient control of this risk factor.

Methods
Design and patients
This was a cross-sectional study based on data collected by the CIFARC group (‘Control Integral de los FActores de Riesgo Cardiovascular’, or ‘comprehensive management of cardiovascular risk factors’). CIFARC comprises 44 physicians, all members of the Spanish Society of Internal Medicine, who belong to General Medicine Departments from a total of 36 hospitals. The centers are located all over Spain, and are representative of all regions of the country (Appendix 1). Patients are referred to those General Medicine Departments by Primary Care doctors or by other medical specialists. When physicians of the group attend out-patients with high or very high risk of cardiovascular disease, they collect sociodemographic, clinical and resource utilization data from subjects, according to standardized criteria, and they store the data in an Internet application specifically developed for that purpose, available at [http://www.fesemi.org/]. The database is officially registered according to Spanish regulations.

The CIFARC group considers hypertension, dyslipidaemia and diabetes mellitus as adequately controlled when the respective goals of published guidelines or recommendations are met.9–11 Smoking habit was considered controlled when the patient has abstained for at least 6 months.

This study specifically focused on the evaluation of patients with hypertension, one of the major cardiovascular risk factors assessed by the CIFARC group. The analysis of patients with the other risk factors, as well as comparison of baseline control of risk factors with that at follow-up, is reported elsewhere.12

Patients (male and female) were included in this study if they met all the following criteria: (i) age >18 years; (ii) attended an out-patient clinic of a participating General Medicine Department at least once from July 2002 to August 2003; (iii) had a high or very high cardiovascular risk, as defined by an absolute risk of ≥20% at 10 years in the Framingham study;12,13 (iv) had a diagnosis of hypertension, as defined in guidelines;9,14 (v) were not pregnant; (vi) were not terminally ill; and (vii) gave informed consent.

Study variables
The following data were collected for every patient and analysed.

Sociodemographic
Age, weight, height, body mass index, degree of obesity, gender, and geographic location (either metropolitan—Madrid or Barcelona—or non-metropolitan—all other regions).

Cardiovascular risk factors
Hypertension controlled or not, systolic and diastolic blood pressure measured according to guidelines9 on the day of the visit, low-density lipoprotein (LDL) cholesterol serum level (calculated using the Friedewald formula), LDL cholesterol serum level controlled or not, diabetes mellitus present or not, diabetes controlled or not (in patients with diabetes), haemoglobin A1c level (in patients with diabetes), smoking habit (past, current or never), and smoking habit controlled or not (in past and/or current smokers).

Health care resource utilization
Data for cardiovascular care, unless otherwise specified, during the previous year. Overall number of doctors who had provided care to patients, specialists other than Primary Care and Internal Medicine physicians who had provided care to patients, number of visits to all doctors, number of visits to specialists other than Primary Care and Internal Medicine, number of visits to Emergency Departments, number of admissions to hospitals,
number of blood analyses, number of urine analyses, number of electrocardiograms, number of chest radiographs, number of echocardiograms, number and type of other diagnostic procedures, taking medication for hypertension or not, taking medication for diabetes mellitus or not, taking medications for lipids or not, taking platelet aggregation inhibitor or anticoagulant medication or not, number of pills taken per day for any reason, and number of pills taken per day for cardiovascular disease prevention or treatment.

Statistical analysis

A Little’s MCAR test was used to assess deviation from randomness in missing values of study variables. For univariate analysis, the following tests were used as needed: χ² for discrete variables, and Mann-Whitney U for continuous variables. A multivariate logistic regression analysis was done to assess the possible association of uncontrolled hypertension with the most representative of the other study variables. All p values were two sided, at the 0.05 significance level.

Results

Overall, 2211 patients from the CIFARC group met the inclusion criteria, representing 97.6% of those recruited by the group in the study period. Eighty-four missing values on continuous variables were found not to deviate from randomness, and were inserted using the EM method. Six patients with missing values on discrete variables were deleted. Therefore, 2205 patients were finally included in the study. The median (IQR) of blood pressure of the whole group of patients was: 140 (130–160) mmHg systolic and 80 (75–90) mmHg diastolic. Systolic blood pressure was ≥200 mmHg in 54 subjects (2.4%) and 180 mmHg or higher in 213 (9.6%). Diastolic blood pressure was 120 mmHg or higher in 28 patients (1.2%). Hypertension was properly controlled in 821 (37.2%) of patients and uncontrolled in the other 1384 (62.8%).

Table 1 summarizes the sociodemographic characteristics of patients, for the whole group, and for divided into those with controlled/uncontrolled hypertension. Figure 1 shows the proportions of patients with controlled or uncontrolled hypertension, as a function of the different degree of obesity.15

Table 2 shows the study results for the prevalence and control of major cardiovascular risk factors other than hypertension, again for the whole group, and for divided into those with controlled/uncontrolled hypertension. The medians (IQR) for
LDL cholesterol were: whole group 128.0 (102.0–152.0) mg/dl; controlled hypertension 120.0 (96.0–144.0) mg/dl (p < 0.001). The medians (IQR) for haemoglobin A1c in diabetes patients (percentage of total haemoglobin) were: whole group 7.00% (6.20–8.05), controlled hypertension 6.90% (6.02–7.80), and uncontrolled hypertension 7.10% (6.30–8.10) (p = 0.01).

Tables 3 and 4 summarize medical resource utilization by the study patients during the previous year because of cardiovascular care, unless otherwise specified. The specialties, other than general internal medicine or primary care, most frequently attended by the study patients were: cardiology 569 patients (25.8%); endocrinology 152 (6.9%); neurology 101 (4.6%); vascular surgery 62 (2.8%); and nephrology 61 (2.8%).

The diagnostic procedures (other than those reported in Table 3) most frequently performed to the study patients were: computed tomography (CT) scan of the head, 159 patients (7.2%); carotid doppler, 181 (8.2%); treadmill exercise test, 144 (6.5%); CT scan of the abdomen, 75 (3.4%); CT scan of the chest, 58 (2.6%); arteriography, 49 (2.2%); and radionuclide test of the kidney, 14 (0.6%). Overall, these procedures were done in a greater percentage of patients with controlled hypertension (29.0%) than in those with uncontrolled hypertension (22.7%) (p < 0.001).

A direct logistic regression analysis was done, with controlled or uncontrolled hypertension as the outcome. Variables in Table 5 were included as predictors (independent variables). The other study variables were not included, because of association with other included variables.
A test of the full model against a constant-only model was statistically reliable ($p < 0.001$), indicating that independent variables reliably predicted the dependent variable. The variance in dependent variable accounted by independent variable was small, however ($Cox and Snell R^2 = 0.069$). Prediction success was modest, with only 26% of patients with controlled hypertension and 89% of patients with uncontrolled hypertension correctly predicted, for an overall success rate of 66%. Table 5 shows regression coefficients, Wald test, odds ratios and 95% CIs for odds ratios for each independent variable. Using a criterion of $\alpha = 0.003$ (to compensate for inflated type I error), a reliable association was found between uncontrolled hypertension and the following variables, ordered in descending strength of association: higher LDL cholesterol, taking antihypertensive medication, living in non-metropolitan areas, and having larger body mass index. Uncontrolled hypertension was also probably associated with diabetes mellitus, current smoking, fewer hospital admissions, and not taking hypolipidaemic agents or antiplatelet/anticoagulant agents, although, with the model used, the association was not entirely reliable.

Discussion

Control of cardiovascular risk factors in patients attending out-patient clinics of medicine.
departments of Spanish hospitals, appears to be poor. Hypertension was extremely prevalent in our patients, highlighting the importance of risk factors in people with high or very high risk of cardiovascular disease.

Moreover, hypertension was the risk factor most poorly controlled. Although smoking habit exhibited a greater percentage of lack of control, absolute numbers were much more elevated for uncontrolled hypertension. The problem was especially remarkable for systolic blood pressure, with more than a quarter of patients exhibiting at least stage 2 (moderate) hypertension. This is relevant because systolic hypertension is a much more important cardiovascular risk factor than diastolic hypertension, especially in persons aged >50 years, like the majority of those in the CIFARC group. Large studies in this field were unavailable in Spain. Other studies from developed countries found similar to lesser rates of inadequate control of hypertension, with differences among studies probably due to lack of homogeneity of the assessed populations.6–8,16,17 Insufficient control of hypertension was a clear conclusion in every study.

Univariate analyses showed a strong association of uncontrolled hypertension with obesity, women (vs. men), living in a non-metropolitan area, uncontrolled dyslipidaemia and uncontrolled diabetes mellitus. The multivariate analysis confirmed most of those findings, although the associations were not confirmed for gender or for uncontrolled diabetes mellitus. These results show that poor control of the different cardiovascular risk factors tends to coincide in the same patients. Therefore, efforts to improve control of cardiovascular risk factors, with comprehensive strategies that involve all risk factors, are needed, not only in developing countries, but also in developed countries.17

The association of uncontrolled hypertension with living in non-metropolitan areas was probably a reflection of the difference in standards of living between the two kinds of communities. Similar findings were previously reported in patients with hypertension or other conditions.18,19

Medical resource use data reflect the economic burden to health care systems in developed countries caused by management of hypertension, and other risk factors.20 In univariate and multivariate analyses, resource utilization was similar in patients with controlled or uncontrolled hypertension, except for certain modalities of treatment. Overall, patients made about six visits to doctors per year, and had about three blood analyses per year, because of cardiovascular disease. Visits to Emergency Departments, admissions to hospitals, and several diagnostic procedures, tended to show lower rates in patients with uncontrolled hypertension. This suggests less serious cardiovascular disease in those patients. Less concern with health matters, by patients themselves and/or by their doctors, might be an alternative explanation.

The lower number of pills taken by patients with uncontrolled hypertension for any reason, and the similar number of pills taken for cardiovascular disease by patients with controlled or uncontrolled hypertension, might suggest a lower prevalence of disease other than cardiovascular in the group of patients with uncontrolled hypertension, but less concern with health matters in those patients might again be an alternative explanation.

Univariate and multivariate analyses found a higher rate of antihypertensive treatment in patients with uncontrolled hypertension, suggesting that hypertension is harder to control in those patients. On the other hand, the lower rate of hypolipidaemic and antiplatelet/anticoagulant medications taken by those patients, suggests again either less prevalence of serious cardiovascular disease or insufficient management of cardiovascular risk factors other than hypertension.

The number of participating centres, representative of all regions of the country, and the size of the population of patients included, support the validity of the conclusions reached in this study.

Programs to improve control of cardiovascular risk factors are clearly needed. Enhancing patients’ knowledge about the characteristics of hypertension and the consequences of the deficient control of the risk factor may help, not only to increase adherence to treatment, but also to improve control of hypertension.21 Further efforts by health personnel to comply with guidelines are also probably needed.22,23

Our study shows that in Spain, hypertension is inefficiently controlled in patients at high risk of cardiovascular disease. Association of hypertension with other cardiovascular risk factors is common, with poor control frequently being accompanied by several risk factors.

References


Appendix

The CIFARC group is composed of the following physicians (with respective affiliations): M. Muñoz (Hospital de León, León), C. Suárez (Hospital de la Princesa, Madrid), J. Garré (Clínica Virgen de la Vega, Murcia), M. Camafort (Hospital de Mora d’Ebre, Mora d’Ebre, Tarragona), B. Roca (Hospital General, Castellón), J. Alcalá (Hospital Valle de los Pedroches, Pozoblanco, Córdoba), A. Ceballos Hospital de Antequera, Antequera, Málaga), J. M. Varela (Hospital Virgen del Rocío, Sevilla), F. Nonell (Hospital l’Esperit Sant, Santa Coloma de Gramanet, Barcelona), J. Montes (Hospital do Meixoeiro, Vigo, Pontevedra), J. Sobrino (Hospital l’Esperit Sant, Santa Coloma de Gramanet, Barcelona), P. Cía (Hospital Clínico, Zaragoza), J. I. Cuende (Hospital San Telmo, Palencia), I. González (Hospital de Alcorcón, Alcorcón, Madrid), A. Sánchez (Hospital Clínico, Salamanca), J. Sedeño (Hospital de Antequera, Antequera, Málaga), J. S. Felgueira (Hospital Gregorio Marañón, Madrid), A. González (Hospital Valle de los Pedroches, Pozoblanco, Córdoba), R. García (Hospital Virgen del Rocío, Sevilla), L. Micó (Hospital La Fe, Valencia), A. J. Alcaide (Centro de Salud de Baltanás, Palencia), A. Colodro (Complejo Hospitalario de Jaén, Jaén), J. Toril (Centro Médico y de Rehabilitación, Castelldefels, Barcelona), A. Velasco (Hospital de Cabueñas, Gijón,
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