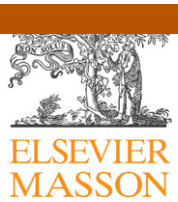
Archives of Cardiovascular Disease (2012) 105, 271—280



Available online at
SciVerse ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en

CLINICAL RESEARCH

Gender-related differences in the management of hypertension by cardiologists: The PARITE study

Prise en charge par les cardiologues de l'hypertension artérielle en fonction du sexe : l'étude Parite

Claire Mounier-Vehier[a,*], Tabassome Simon[b,c], Dominique Guedj-Meynier[d], Marc Ferrini[d], Emmanuel Ghannad[e], Jean-Pierre Hubermann[d], Gérard Jullien[d], Pascal Poncelet[f], Assya Achouba[g], Stéphane Quéré[g], Maxime Guenoun[d]

[a] *Pôle cardiovasculaire et pulmonaire, médecine vasculaire et hypertension artérielle, faculté Henri-Warembourg, université de Lille-2, CHRU de Lille, avenue Oscar-Lambret, 59037 Lille cedex, France*
[b] *Université Pierre-et-Marie-Curie-Paris, UPMC-Paris-06, 4, place Jussieu, 75252 Paris, France*
[c] *Service de pharmacologie, hôpital Saint-Antoine, AP—HP, 134, rue du Faubourg-Saint-Antoine, 75571 Paris cedex 12, France*
[d] *Collège national des cardiologues français, 13, rue de Nieppe, 75014 Paris, France*
[e] *91190 Gif-sur-Yvette, France*
[f] *Polyclinique de Hénin-Beaumont, route de Courrières, 62110 Hénin-Beaumont, France*
[g] *Novartis Pharma SAS, 2 et 4, rue Lionel-Terray, 92500 Rueil-Malmaison, France*

Received 1st October 2011; received in revised form 10 March 2012; accepted 15 March 2012
Available online 23 May 2012

KEYWORDS
Cardiovascular disease;
Gender;
Global cardiovascular risk;
Hypertension;
Women

Summary
Background. — Several studies have shown gender differences in the management of cardiovascular risk factors and diseases. Whether the management of hypertension by cardiologists in France differs according to patient gender has not been fully investigated.
Aims. — The main objective of this cross-sectional, multicentre study was to examine the management according to gender of hypertensive patients by office-based cardiologists in France.
Methods. — Cardiologists were asked to include consecutively two men and two women attending a routine consultation for essential hypertension. Therapeutic management was evaluated by comparing cardiovascular investigations in the preceding 6 months and hypertension control according to gender and the patients' global cardiovascular risk.

Abbreviations: BP, blood pressure; CVD, cardiovascular disease; CVRF, cardiovascular risk factor; DBP, diastolic blood pressure; GCVR, global cardiovascular risk; SBP, systolic blood pressure.

* Corresponding author. Fax: +33 3 20 44 40 78.
E-mail address: claire.mounier-vehier@chru-lille.fr (C. Mounier-Vehier).

1875-2136/$ — see front matter
doi:10.1016/j.acvd.2012.03.003

Results. — Overall, data from 3440 adult patients (53% men) referred to 654 cardiologists were analysed. Hypertension was uncontrolled in 76% of both men and women and 69% were at high global cardiovascular risk (75% of men, 62% of women; $P < 0.001$). Significantly fewer cardiovascular investigations had been performed in the preceding 6 months in women (22.6% vs 44.2% in men; $P < 0.001$). The treatment regimen was changed by the cardiologist in approximately 50% of patients regardless of gender or global cardiovascular risk.
Conclusions. — The PARITE study shows that in French office-based cardiology practice, the antihypertensive regimen is adjusted as often in female as in male patients. However, the results suggest that there is room for improvement in the investigation of cardiovascular disease in women. Healthcare providers could be encouraged to implement established guidelines on the prevention of cardiovascular disease in women.

MOTS CLÉS
Femmes ;
Hypertension ;
Ischémie myocardique ;
Maladie cardiovasculaire ;
Risque cardiovasculaire global ;
Traitement

Résumé
Contexte. — Le risque cardiovasculaire est généralement sous-estimé chez la femme. La maladie cardiovasculaire peut se manifester différemment et nécessiter des stratégies thérapeutiques différentes chez l'homme et la femme.
Objectifs. — L'objectif principal de cette étude française observationnelle, transversale, multicentrique, a été d'évaluer en fonction du sexe, la prise en charge par des cardiologues libéraux de l'hypertension artérielle (HTA) et du risque cardiovasculaire global.
Méthodes. — Les cardiologues devaient inclure les deux premiers hommes et les deux premières femmes vus en consultation de routine pour une hypertension essentielle. La prise en charge était analysée en termes de décision thérapeutique à la fin de la visite, en fonction du sexe, du risque cardiovasculaire (CV) global et du contrôle de l'hypertension. Les examens CV complémentaires des six mois précédents étaient également analysés.
Résultats. — Parmi les 3440 patients adultes (53 % hommes et 47 % femmes) inclus dans cette analyse par 654 cardiologues, 76 % de la population globale de l'étude, ainsi que des femmes et des hommes avaient une HTA non contrôlée et 69 % un risque cardiovasculaire global élevé (75 % des hommes, 62 % de femmes ; $p < 0{,}001$). Le traitement antihypertenseur a été modifié de la même manière dans les deux sexes pour 50 % des patients. Enfin, 44,2 % des hommes et 22,6 % des femmes ont bénéficié d'un dépistage de l'ischémie myocardique ($p < 0{,}001$).
Conclusions. — L'étude Parite montre qu'en France, dans une population d'hypertendus suivis par des cardiologues libéraux, l'adaptation du traitement antihypertenseur se fait de manière équivalente entre hommes et femmes, et reste conditionnée par le contrôle tensionnel et ce indépendamment du niveau de risque cardiovasculaire global. Une amélioration de la prise en compte des recommandations spécifiques dans le diagnostic et le traitement de la maladie cardiovasculaire chez la femme reste néanmoins nécessaire pour une prévention efficace.

Background

While there is a popular perception that women are less susceptible to cardiovascular disease (CVD), it is less well recognized that this is no longer true after menopause: in Europe, cardiovascular mortality is in fact higher in women than in men (55% compared with 43%) [1]. However, CVD presents differently in men and women [2] and there is evidence that treatment efficacy is different between genders; for example, compared with male patients, aspirin is more effective in female patients in preventing stroke [3] whereas it is less effective in preventing myocardial infarction [4]. However, it has been shown that antihypertensive treatment can be as effective in women as in men [5]. In this context, the Women at Heart initiative was launched by the European Society of Cardiology in 2005 to highlight the growing burden and under-appreciation of heart disease in women and to improve the management of women at risk of CVD in clinical practice. This initiative focused on the evaluation of cardiovascular risk factors (CVRFs) (especially the weighting of the various different factors) and the prescription of adapted treatment regimens [4]. Consequently, the newly released Proceedings of the European Society of Cardiology Workshop on Gender Differences in CVD emphasized the need to implement strategies that improve perspectives in women [6,7].

The percentage of patients being treated for hypertension in France rose from 19.6% of the population in 2000 to 22.8% in 2006 [8]. It has been conclusively demonstrated that lowering high blood pressure (BP) by drug treatment reduces the incidence of fatal and non-fatal cardiovascular events [9,10]. However, BP is just one of the major factors that affects cardiovascular risk [11]. Therefore, to decide on the therapeutic approach to be adopted for a given patient, the current European guidelines recommend taking into account not only BP but also the patient's global cardiovascular risk (GCVR) based on CVRFs, end-organ damage and intercurrent cardiovascular or renal disease [12]. Similarly,

the current French recommendations promote a holistic approach in which more aggressive pursuit of BP control is warranted in patients at higher cardiovascular risk [13].

Barriers to effective CVD management in women exist. Among these barriers, the American Heart Association has identified confusion as a result of mixed messages from the media, women not perceiving themselves to be at risk and healthcare providers failing to inform women of the value of prevention in CVD [14]. A recent report of the EuroHeart project has shown that women are still under-represented in many cardiovascular clinical trials although there are important gender differences in most areas of heart disease [7].

Very little is known about how French cardiologists manage hypertension in the office or clinical setting, especially with respect to gender. The PARITE study was organized to gain insight into how French cardiologists are managing male and female hypertensive patients in an office setting.

Methods

In this cross-sectional, observational, French multicentre study, cardiologists were randomly selected from a geographically stratified database (IDREM) and invited to participate in the study. Those who agreed were asked to include, over a period of 3 months, the first four consecutive patients fulfilling the inclusion criteria (two men and two women, in no stipulated order). The patients included were adult outpatients with essential hypertension but no acute condition, attending for a routine consultation. Patients with secondary or malignant hypertension and pregnant women were excluded.

The primary endpoint was the therapeutic decision resulting from the visit, with a focus on changes in the patient's treatment regimen according to both gender and GCVR status as defined by the French Health Authority recommendations [13].

CVD management was defined as the therapeutic decision made at the end of the visit coupled with an analysis of the complementary cardiovascular investigations (echocardiography, exercise stress testing, coronary angiogram and sleep apnoea test) performed within the previous 6 months.

CVD management was assessed in the patient population as a whole and broken down according to gender, GCVR, end-organ damage, hypertension control and geographic region.

All data were recorded at a single visit on the basis of a physical examination, the patient's medical records and an interview. Systolic BP (SBP) and diastolic BP (DBP) were measured in line with current French guidelines: two readings were made at least 5 minutes apart with the patient in a sitting position (after a rest of at least 5 minutes); the result recorded was the mean of the two readings. BP control was defined as BP less than 140/90 mmHg, or less than 130/80 mmHg if the patient was diabetic or had impaired kidney function.

Data were acquired on: demographic details; body weight and height; medical and surgical history; family history of premature cardiovascular events; diabetes; blood lipid levels; smoking status; abdominal obesity; lifestyle; alcohol consumption; end-organ damage (microalbuminuria readings and left ventricular hypertrophy as measured by electrocardiography and echocardiography); concomitant cardiovascular and kidney disease; and any additional cardiovascular tests or procedures performed within 6 months prior to the study visit. Antihypertensive treatment details and other cardiovascular drugs were recorded. At the end of the visit, cardiologists recorded any change in the antihypertensive treatment regimen (i.e. an increase in dosage of the same drug, a change of drug within the same class, a change of class or the discontinuation of one or more drugs).

GCVR was classified according to French guidelines as low, medium or high based on BP and other CVRFs.

Statistical analysis

The results of statistical analyses are presented as mean and standard deviation values for quantitative variables and as frequencies for qualitative variables. Significance was estimated using the appropriate test (Wilcoxon for quantitative and chi-square for qualitative variables) with a confidence level of 5%.

Two multivariable analyses — one in patients at medium GCVR and one in patients at high GCVR — were carried out to identify factors that independently correlated with the prescription of any test designed to investigate myocardial ischaemia (exercise testing together with stress echocardiography, magnetic resonance imaging or scintigraphy), collectively referred to as ''pooled tests''.

All statistical analyses were performed using SAS 8.2 software (SAS Institute, Cary, NC, USA).

Results

Between March and August 2010, 654 office-based cardiologists throughout France participated in the study. The physicians had a mean of 18.8 years of experience (median: 20 years). Out of a total of 3456 patients initially included, 16 were excluded from analysis because of missing key data (BP measurements in most cases). Thus, the analysed population consisted of 3440 hypertensive patients. Baseline social, demographic and clinical data are presented for this population as a whole and broken down according to gender (53% men, 47% women) (Table 1). Compared with the female subpopulation, the mean age of the men was lower (because of a higher proportion of women aged over 75 years), with a higher body mass Index (BMI) and a higher frequency of presence of three or more CVRFs. In addition, more of the men were heavy drinkers (18% of men, 3% of women) and had end-organ damage (essentially left ventricular hypertrophy as measured by electrocardiography and echocardiography), documented CVD (myocardial infarction, coronary heart failure, aortic aneurysm or dissection and peripheral atherosclerosis) or kidney failure (Table 1).

The proportion of both genders in the high-GCVR category was high, accounting for over two-thirds of all the patients, but it was higher in men (75% of men, 62% of women; $P < 0.001$) due to higher rates of diabetes, dyslipidaemia and smoking.

There were no significant BP differences between men and women (mean SBP/DBP ± standard deviation:

Table 1 Baseline social, demographic and clinical data.

	Men ($n = 1819$)		Women ($n = 1621$)		Total ($n = 3440$)		P
	Data	Missing data (n)	Data	Missing data (n)	Data	Missing data (n)	
Social and demographic data							
Age (years)	64.60 ± 11.62	2	67.30 ± 12.18	2	65.80 ± 11.96	2	< 0.001[a]
Age classes (years)							
< 50	184 (10.1)		138 (8.5)		322 (9.4)		
50—65	694 (38.2)		485 (30.0)		1179 (34.3)		
65—75	549 (30.2)		493 (30.5)		1042 (30.3)		
≥ 75	390 (21.5)		503 (31.1)		893 (26.0)		< 0.001[b]
BMI (kg/m^2)	28.00 ± 4.11	9	27.00 ± 5.04	14	27.50 ± 4.60	23	< 0.001[a]
BMI classes (kg/m^2)							
< 25	413 (22.8)		625 (38.9)		1038 (30.4)		
25—30	930 (51.4)		591 (36.8)		1521 (44.5)		
≥ 30	467 (25.8)		391 (24.3)		858 (25.1)		< 0.001[b]
GCVR							
Low	20 (1.1)		81 (5.0)		101 (2.0)		
Medium	441 (24.2)		528 (32.6)		969 (28.2)		
High	1358 (74.7)		1012 (62.4)		2370 (68.9)		< 0.001[b]
CVRFs							
Age > 50 (men) or > 60 (women)	1600 (88.1)	2	1170 (72.3)	2	2770 (80.6)	4	< 0.001[b]
Family history of CV events	400 (23.5)	116	317 (20.9)	104	717 (22.3)	220	0.078
Diabetes (treated or untreated)	538 (29.7)	8	406 (25.2)	10	944 (27.6)	18	0.003[b]
High cholesterol[c]	1173 (65.6)	27	933 (58.2)	18	2106 (62.0)	45	< 0.001[b]
Smoker	442 (24.5)	15	188 (11.7)	15	630 (18.5)	30	< 0.001[b]
Number of risk factors							
0	44 (2.4)		144 (8.9)		188 (5.5)		
1 or 2	1040 (57.2)		1042 (64.3)		2082 (60.5)		
≥ 3	735 (40.4)		435 (26.8)		1170 (34.0)		< 0.001[b]
Other relevant conditions							
Abdominal obesity	799 (44.4)	1	672 (41.9)	18	1471 (43.3)	39	0.139[b]
Sedentary lifestyle	1090 (60.1)	5	1131 (70.1)	8	2221 (64.8)	13	< 0.001[b]
Excessive alcohol consumption	314 (17.8)	53	42 (2.6)	21	356 (10.6)	74	< 0.001[b]
End-organ involvement							
At least one organ	741 (40.7)		538 (33.2)		1279 (37.2)		< 0.001[b]
Left ventricular hypertrophy	669 (37.2)	21	452 (28.4)	30	1121 (33.1)	51	< 0.001[b]
Microalbuminuria	199 (15.4)	527	162 (14.8)	526	361 (15.1)	1053	0.680[b]
CV and kidney disease							
At least one CV or kidney disease	739 (40.6)		453 (27.9)		1192 (34.7)		< 0.001[b]
Kidney failure (GFR < 60 mL/minute) or protein-uria > 500 mg/day	157 (8.9)	56	142 (9.0)	45	299 (9.0)	101	0.916[b]
TIA or stroke	147 (8.1)	8	139 (8.6)	8	286 (8.4)	16	0.597[b]
MI	196 (10.8)	12	64 (4.0)	9	260 (7.6)	21	< 0.001[b]

Table 1 (*Continued*)

	Men ($n=1819$)		Women ($n=1621$)		Total ($n=3440$)		P
	Data	Missing data (n)	Data	Missing data (n)	Data	Missing data (n)	
Coronary heart failure (without MI)	248 (13.8)	18	144 (8.9)	11	392 (11.5)	29	< 0.001[b]
Peripheral atherosclerosis	261 (14.6)	29	85 (5.3)	17	346 (10.2)	46	< 0.001[b]
Aortic aneurysm or dissection	77 (4.3)	37	20 (1.3)	28	97 (2.9)	65	< 0.001[b]

Data are mean ± standard deviation or number (%). BMI: body mass index; CV: cardiovascular; CVRF: cardiovascular risk factor; GCVR: global cardiovascular risk; GFR: glomerular filtration rate; MI: myocardial infarction; TIA: transient ischaemic attack.
[a] Wilcoxon test.
[b] Chi-square test.
[c] Low-density lipoprotein cholesterol ≥ 1.6 g/L (4.1 mmol/L), high-density lipoprotein cholesterol ≤ 0.40 g/L (1 mmol/L).

146/84 ± 17/10 mmHg for men, 147/84 ± 18/11 mmHg for women).

Hypertension was controlled in less than one-quarter of both groups (Table 2) and uncontrolled in over 92% of patients with diabetes or kidney failure, with no difference according to gender (92.0% in men and 92.9% in women; $P=0.84$).

No major differences according to gender were observed regarding drug regimens, with three-quarters of patients using two drugs or more and over one-third receiving at least three different drugs.

At the end of the visit, cardiologists modified the antihypertensive treatment in over 50% of patients, with no significant difference emerging between men and women (52.7% for men vs 54.8% for women; $P=0.21$ [Fig. 1A]). Conversely, the higher the BP, the greater the likelihood of the treatment being changed, regardless of GCVR (Fig. 1B and C). Most of the changes consisted of a switch to another class of drug (41.0% of all changes) and/or the addition of at least one drug (46.7% of changes) (Fig. 2).

An analysis of additional cardiovascular investigations performed in the 6 months prior to the visit revealed marked

Table 2 Blood pressure and hypertension.

	Men ($n=1819$)	Women ($n=1621$)	Total ($n=344$)	P
SBP (mmHg)	146.00 ± 16.83	147.20 ± 17.83	146.60 ± 17.31	0.052[a]
DBP (mmHg)	84.20 ± 10.29	83.50 ± 10.61	83.80 ± 10.45	0.051[a]
BP grade				
BP < 140/90 mmHg	574 (31.6)	522 (32.2)	1096 (31.9)	
140 ≤ SBP < 160 and 90 ≤ DBP < 100 mmHg	744 (40.9)	597 (36.8)	1341 (39.0)	
160 ≤ SBP < 180 and 100 ≤ DBP < 110 mmHg	414 (22.8)	409 (25.2)	823 (23.9)	
BP ≥ 180/110 mmHg	87 (4.8)	93 (5.7)	180 (5.2)	0.059[b]
HT history (years)[c]	10.10 ± 7.90	11.00 ± 8.50	10.50 ± 8.20	0.012[a]
HT first diagnosed in the last year	39 (2.2)	49 (3.1)	88 (2.6)	0.003[b]
HT controlled[d]	438 (24.1)	401 (24.7)	839 (24.4)	0.653[b]
Number of antihypertensive drugs				
0	16 (0.9)	20 (1.2)	36 (1.0)	
1	457 (25.1)	412 (25.4)	869 (25.3)	
2	627 (34.5)	607 (37.4)	1234 (35.9)	
≥ 3	719 (39.5)	582 (35.9)	1301 (37.8)	

Data are mean ± standard deviation or number (%). BP: blood pressure; DBP: diastolic blood pressure; HT: hypertension; SBP: systolic blood pressure.
[a] Wilcoxon test.
[b] Chi-square test.
[c] Missing data: men ($n=37$); women ($n=33$); total ($n=70$).
[d] HT controlled if BP < 140/90 mmHg (or 130/80 mmHg in patients with diabetes or kidney failure).

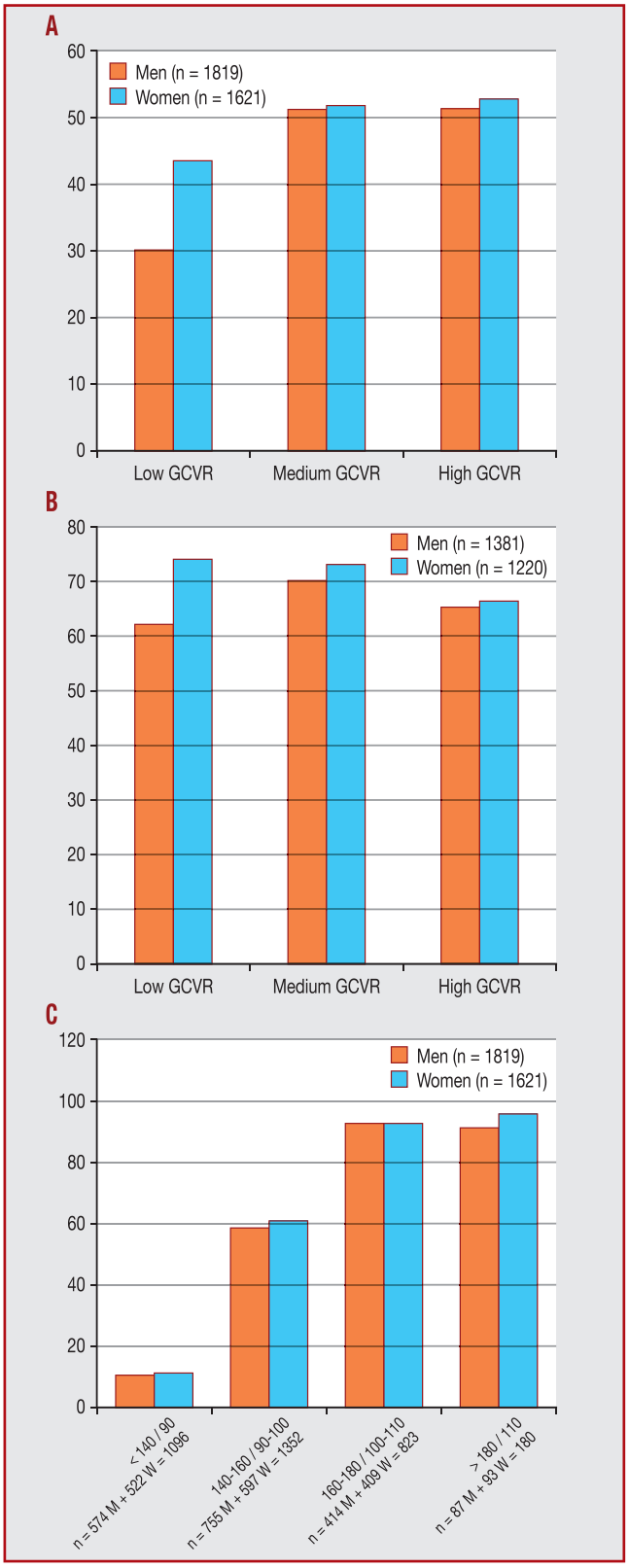


Figure 1. Treatment change after the consultation. A. Population as a whole ($n = 3440$). B. Subpopulation of patients with uncontrolled blood pressure ($n = 2601$). C. Population as a whole according to blood pressure range. GCVR: global cardiovascular risk.

differences between men and women (Table 3). Exercise stress tests had been performed more than twice as often in men as in women (40.7% vs 18.8%; $P < 0.001$). When all means of investigating myocardial ischaemia (i.e. 'pooled tests') were considered, 44.2% of the men had a further investigation compared with 22.6% of the women ($P < 0.001$). Similar gender-related differences were seen when this variable was analysed according to GCVR sub-population (Table 3). Moreover, tests to investigate sleep apnoea (17% in men, 8% in women; $P < 0.001$) and vascular Doppler ultrasonography (43% in men, 37% in women; $P < 0.001$) were all prescribed less frequently in women than men.

After adjustment for the appropriate variables (age, BMI, hypertension duration, smoking status, inactivity, alcohol consumption and aortic aneurysm or dissection for medium GCVR; age, BMI, severity of hypertension, hypertension duration, family history of premature cardiovascular events, diabetes, dyslipidaemia, smoking status, inactivity, alcohol consumption, kidney failure, transient ischaemic attack/stroke, myocardial infarction, coronary heart failure and peripheral atherosclerosis for high GCVR) the chance of having a 'pooled test' remained higher in men than in women in both the medium-GCVR and high-GCVR groups (odds ratio 2.49, 95% confidence interval 1.78—3.49, $P < 0.001$ and odds ratio 1.94, 95% confidence interval 1.58—2.40, $P < 0.001$, respectively).

The other factors associated with prescription of a ''pooled test'' were age and smoking in the medium-GCVR population, and a family history of cardiovascular events, a history of myocardial infarction or coronary artery disease, age, diabetes, high cholesterol, moderate hypertension and smoking in the high-GCVR population (Fig. 3A—D).

Discussion

The primary objective of the PARITE study was to assess the therapeutic decision resulting from a single study visit. Complementary cardiovascular investigations performed in the 6 months before the study visit were recorded as such in the database and analysed. Complementary cardiovascular investigations prescribed or performed at the study visit were not addressed.

The main finding of the PARITE study was that the decision to modify BP treatment in a representative population of hypertensive patients referred to an office-based cardiologist was not related to gender. In patients with uncontrolled hypertension, the treatment regimen was changed regardless of GCVR class. The treatment regimen was modified in: 90% of uncontrolled patients when SBP is greater than or equal to 160 mmHg and/or DBP is greater than or equal to 100 mmHg; 60% of moderately uncontrolled patients (140—160/90—100 mmHg); and only 10% of controlled patients (< 140/90 mmHg). However, the data collected regarding the cardiologist's decisions only concerned treatment modification at the visit itself and ignored any other measures that may have been implemented afterwards, such as ambulatory 24-hour BP monitoring, a procedure to investigate renal artery stenosis or a diagnosis of sleep apnoea. Thus, any measure undertaken to obtain information in order to decide on treatment strategy at a later

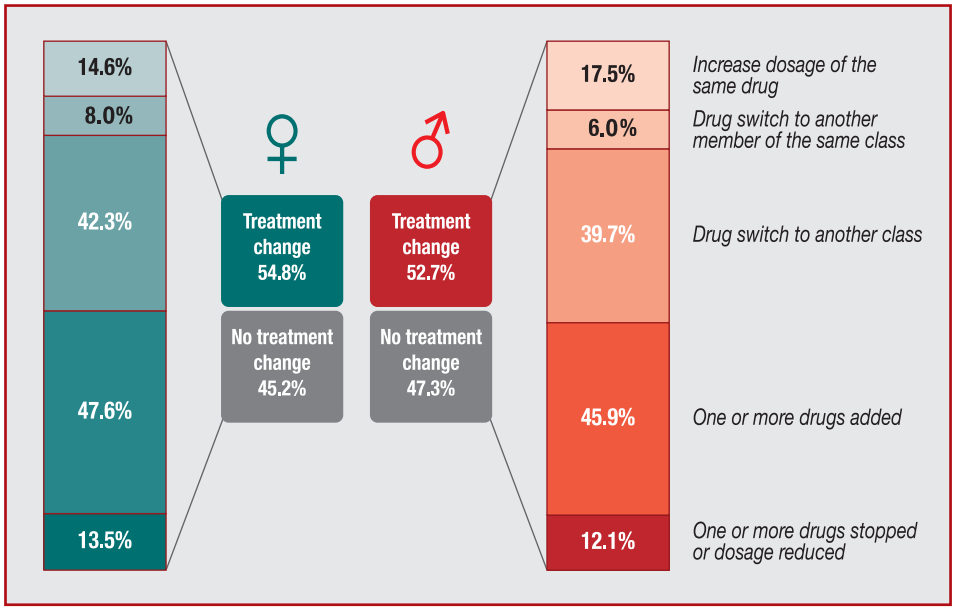


Figure 2. Nature of changes in treatment at the end of the consultation.

Table 3 Complementary examinations performed in the preceding 6 months.

	Men		Women		Total		P[a]
	n (%)	Missing data (*n*)	*n* (%)	Missing data (*n*)	*n* (%)	Missing data (*n*)	
Pooled stress test[b]							
Total population[c]	800 (44.2)	8	363 (22.6)	14	1163 (34.0)	22	< 0.001
High-risk population[d]	663 (49.1)	8	271 (26.9)	6	934 (39.6)	14	< 0.001
Patients with no history of CHD[e]	491 (35.9)	7	265 (18.9)	14	756 (27.3)	21	< 0.001
Investigation of sleep apnoea							
Total population[c]	308 (17.1)	21	131 (8.2)	23	439 (12.9)	44	< 0.001
High-risk population[d]	272 (20.3)	17	102 (10.3)	18	374 (16.0)	35	< 0.001
Vascular Doppler ultrasonography							
Total population[c]	776 (43.2)	22	593 (36.9)	16	1369 (40.2)	38	< 0.001
High-risk population[d]	676 (50.4)	18	471 (47.0)	9	1147 (49.0)	27	0.095
Standard or transoesophageal echocardiography							
Total population[c]	1201 (66.5)	12	1061 (65.8)	9	2262 (66.2)	21	0.691
High-risk population[d]	953 (70.6)	9	732 (72.6)	4	1685 (71.5)	13	0.294
Ambulatory BP monitoring							
Total population[c]	642 (35.6)	14	596 (37.0)	12	1238 (36.3)	26	0.271
High-risk population[d]	464 (34.5)	13	370 (36.8)	7	834 (35.5)	20	0.245
Ambulatory ECG							
Total population[c]	260 (14.4)	19	220 (13.7)	17	480 (14.1)	36	0.542
High-risk population[d]	218 (16.3)	18	154 (15.4)	10	372 (15.9)	28	0.556

BP: blood pressure; CHD: coronary heart disease; ECG: electrocardiography.
[a] Chi-square test.
[b] Exercise testing + stress echocardiography/magnetic resonance imaging/scintigraphy.
[c] *n* = 1819 men + 1621 women = 3440.
[d] *n* = 1358 men + 1012 women = 2370.
[e] *n* = 1375 men + 1413 women = 2788.

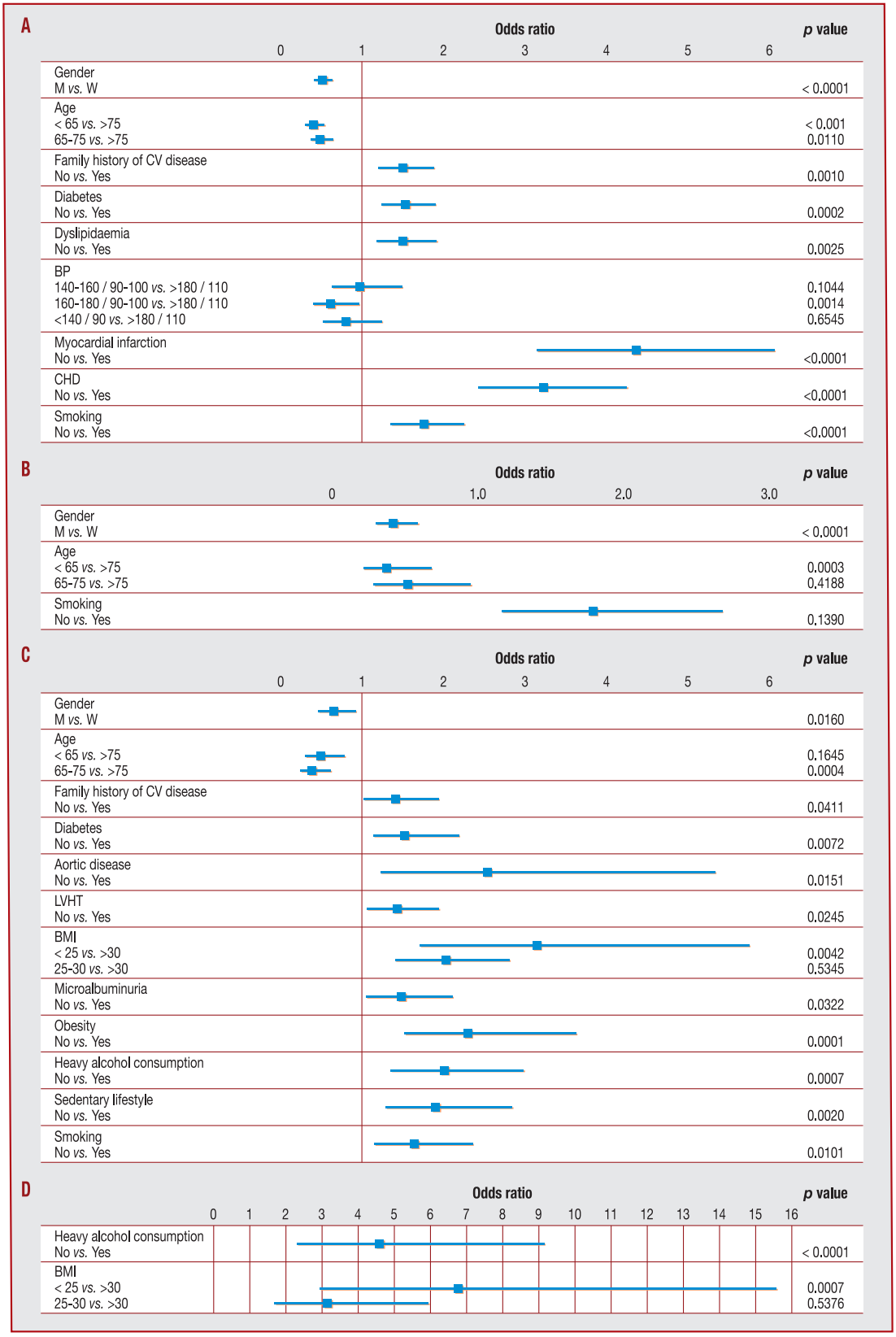


Figure 3. Factors that determined whether or not a ''pooled test'' was ordered (logistic regression). A. A pooled test in patients at high global cardiovascular risk. B. A pooled test in patients at medium global cardiovascular risk. C. A sleep apnoea test in patients at high global cardiovascular risk. D. A sleep apnoea test in patients at medium global cardiovascular risk. BMI: body mass index; BP: blood pressure; CHD: coronary heart disease; CV: cardiovascular; LVHT: left ventricular hypertrophy; M: men; W: women.

date — with temporary deferral of the actual therapeutic decision — would appear in the results as inertia.

The population in the present study was at high risk of cardiovascular events. Compared with a global population treated by general practitioners described in the ENNS survey, where 50.9% of the patients were controlled (58.5% of women vs 41.8% of men; $P = 0.01$) [15], three-quarters of the patients in our study were uncontrolled despite over one-third of them being on three or more antihypertensive drugs. In the MONA LISA survey of hypertensive patients [16], 62% of women and 77.9% of men were controlled (i.e. BP < 140/90 mmHg).

Our results are, however, consistent with those of the International Database on Ambulatory Blood Pressure in relation to Cardiovascular Outcomes (IDACO registry) [17]. In this survey of 9357 patients from 11 countries, 69.7% of hypertensive women and 71.7% of the men were undertreated or uncontrolled at inclusion. In the PHENOMEN study [18], conducted with general practitioners, 52% of uncontrolled hypertensive patients were at high GCVR compared with 72% in the cardiologist-referred population of the PARITE study.

A gender difference with regard to investigations was observed in our study, with fewer tests having been performed to explore myocardial ischaemia in women than in men in the 6 months prior to study visit. This was the case even among those patients with no prior history of coronary disease. A similar gender difference was observed for cardiovascular Doppler ultrasonography. These gender-related differences in CVD management are consistent with findings of previous studies [19,20] and remain unexplained. For example, one study showed that, after a stroke, women have significantly fewer cerebral imaging, Doppler and echocardiography examinations [15]. In another study, on patients with ST-segment elevation myocardial infarction acute coronary syndrome, it was shown that women aged over 65 years are less likely to undergo percutaneous coronary intervention than other patients [2].

Finally, a meta-analysis of clinical trials performed in heart failure showed that only 16 to 23% of women were implanted with a cardioverter defibrillator [1]. Surprisingly in this study with a high percentage of uncontrolled hypertensive patients, few sleep apnoea tests had been performed at all and even fewer in women. Similarly, ambulatory BP monitoring had not been ordered in many cases, although no gender-related difference was observed in this respect.

Limitations

There are two main limitations of this study, above and beyond its cross-sectional design and the lack of information regarding diagnostic investigations at the study visit that may misleadingly point to treatment inertia. The first limitation is that it was a high-risk study population of patients referred to a cardiologist. The results should therefore be analysed cautiously as they may not reflect the global hypertensive population. The second limitation is that the participating cardiologists were aware that one of the purposes of the study was to analyse gender-related differences in the management of hypertension. This could therefore have introduced a bias in the decision-making process although the fact that a gender-related difference was actually detected suggests that any such bias was at least mitigated.

Conclusions

This study shows that in French, office-based, cardiology practice, the antihypertensive regimen is prescribed without taking gender into account. However, the lower frequency of cardiovascular tests prescribed for women confirms that there is room for improvement in the investigation of CVD in women. Encouraging healthcare providers to familiarize themselves with and implement the specific guidelines available is crucial for improving cardiovascular management in women.

Disclosure of interest

Assya Achouba and Stéphane Quéré are Novartis Pharma S.A.S. associates.

Acknowledgements

The authors would like to thank all the investigators from the CNCF network involved in this study. In addition, the authors thank Matrix Consultants, France for assistance in preparing this manuscript for publication and Dr Mathieu Ghadanfar for his thorough review. This study was supported by a grant from Novartis Pharma S.A.S.

References

[1] Stramba-Badiale M, Fox KM, Priori SG, et al. Cardiovascular diseases in women: a statement from the policy conference of the European Society of Cardiology. Eur Heart J 2006;27:994—1005.
[2] Rosengren A, Wallentin L, A KG, et al. Sex, age, and clinical presentation of acute coronary syndromes. Eur Heart J 2004;25:663—70.
[3] Baigent C, Blackwell L, Collins R, et al. Aspirin in the primary and secondary prevention of vascular disease: collaborative meta-analysis of individual participant data from randomised trials. Lancet 2009;373:1849—60.
[4] Gall SL, Donnan G, Dewey HM, et al. Sex differences in presentation, severity, and management of stroke in a population-based study. Neurology 2010;74:975—81.
[5] Gueyffier F, Boutitie F, Boissel JP, et al. Effect of antihypertensive drug treatment on cardiovascular outcomes in women and men. A meta-analysis of individual patient data from randomized, controlled trials. The INDANA Investigators. Ann Intern Med 1997;126:761—7.
[6] Fricker J. Women's heart health: the focus of this issue. Eur Heart J 2011;32:1301—10.
[7] Maas AH, van der Schouw YT, Regitz-Zagrosek V, et al. Red alert for women's heart: the urgent need for more research and knowledge on cardiovascular disease in women: proceedings of the workshop held in Brussels on gender differences in cardiovascular disease, 29 September 2010. Eur Heart J 2011;32:1362—8.
[8] Samson S, Ricordeau P, Pepin S, et al. Hypertension artérielle et facteurs de risque associés : évolutions des traitements entre

2000 et 2006. Caisse nationale d'assurance maladie des travailleurs salariés : points de repères N° 10 2007:1—8.
[9] Collins R, Peto R, MacMahon S, et al. Blood pressure, stroke, and coronary heart disease. Part 2, Short-term reductions in blood pressure: overview of randomised drug trials in their epidemiological context. Lancet 1990;335:827—38.
[10] Staessen JA, Wang JG, Thijs L. Cardiovascular prevention and blood pressure reduction: a quantitative overview updated until 1 March 2003. J Hypertens 2003;21: 1055—76.
[11] Caussé C, Nazal EM, Leutenegger E, et al. Influence des facteurs de risqué cardiovasculaire et de l'atteinte des organes cibles sur le niveau de la pression pulse chez l'hypertendu traité. Arch Mal Coeur Vaiss 2004;P8:27.
[12] Mancia G, De Backer G, Dominiczak A, et al. 2007 ESH-ESC Practice Guidelines for the Management of Arterial Hypertension: ESH-ESC Task Force on the Management of Arterial Hypertension. J Hypertens 2007;25:1751—62.
[13] Haute Autorité de santé. Prise en charge des patients adultes atteints d'hypertension artérielle essentielle — actualisation 2005. Service des recommandations professionnelles: available at: http://www.has-sante.fr/portail/upload/docs/application/pdf/2011-09/hta_05_-_recommandations.pdf.
[14] Mosca L, Banka CL, Benjamin EJ, et al. Evidence-based guidelines for cardiovascular disease prevention in women: 2007 update. Circulation 2007;115:1481—501.
[15] Godet-Thobie H, Vernay M, Noukpoape A, et al. Niveau tensionnel moyen et prévalence de l'hypertension artérielle chez les adultes de 18 à 74 ans, ENNS 2006—2007. Bull Epid Hebd 2008;49-50:478—83.
[16] Wagner A, Sadoun A, Dallongeville J, et al. High blood pressure prevalence and control in a middle-aged French population and their associated factors: the MONA LISA study. J Hypertens 2011;29:43—50.
[17] Boggia J, Thijs L, Hansen TW, et al. Ambulatory blood pressure monitoring in 9357 subjects from 11 populations highlights missed opportunities for cardiovascular prevention in women. Hypertension 2011;57:397—405.
[18] Mounier-Vehier C, Amah G, Covillard J, et al. Management of essential arterial hypertension and cardiovascular risk levels. Observation in general medicine: national PHENOMEN study. Evaluation and stratification of cardiovascular risk based on the 2000 ANAES recommendations in a population of hypertensive patients. Arch Mal Coeur Vaiss 2002;95:667—72.
[19] Simon T, Mary-Krause M, Cambou JP, et al. Impact of age and gender on in-hospital and late mortality after acute myocardial infarction: increased early risk in younger women: results from the French nation-wide USIC registries. Eur Heart J 2006;27:1282—8.
[20] Simon T, Mary-Krause M, Funck-Brentano C, et al. Sex differences in the prognosis of congestive heart failure: results from the Cardiac Insufficiency Bisoprolol Study (CIBIS II). Circulation 2001;103:375—80.