Journal of Clinical & Experimental
Cardiology

Silva, et al., J Clin Exp Cardiolog 2016, 7:3
DOI: 10.4172/2155-9880.1000428

Review Article | Open Access

Who is the Patient with Suspected White Coat Hypertension?

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Received date: March 02, 2016; **Accepted date:** March 30, 2016; **Published date:** March 31, 2016

Abstract

Objectives: The aim of this study is to establish the profile of individuals with suspected white coat hypertension (WCH) submitted to ambulatory blood pressure monitoring (ABPM), assessing gender, age and pressure behavior during monitoring.

Material and method: Between May 2007 and May 2014, a total of 14216 ABPM tests were performed in our department. Of this total, the indication for evaluation of suspected white coat hypertension occurred in 262 tests, which constitute the study sample. The oscillometric method with Dyna-MAPA equipment was used in the study. We have used in statistics: chi-square test of equal proportions and Analysis of Variance (ANOVA).

Results: The sample consists of 262 patients, 121 (46.2%) men and 141 (53.8%) women. The mean age of male patients was 41.9 years and of females, 52.5 years.

The largest group of patients was the one with abnormal results (113 patients, 43.2%). For patients with abnormal report, the proportion of men is significantly higher than that of women. For patients with normal reports, the proportion of women is significantly higher than men. There is no difference in proportion among genders in the group of patients with borderline report. The mean age of the patients classified as normal (49.9) or borderline (49.6) is significantly older than that of patients diagnosed as abnormal (44.7).

Conclusions:

1) Most patients with suspected WCH actually had persistent hypertension at the ABPM;

2) A little over a third of patients with suspected WCH had the diagnosis confirmed by ABPM;

3) The standard patient with WCH in our sample was female and mean age of 50 years.

Keywords: Hypertension; Ambulatory Blood Pressure Monitoring (ABPM); Carotid-femoral; Oscillometric method; Glomerular filteration

Introduction

White coat hypertension (WCH) is the situation in which an individual has high blood pressure (BP) in the medical office (BP >140/90) and normal BP outside the office (BP <135/85). Masked hypertension (MHT) is the opposite of WCH, i.e., a situation in which a person has normal BP in the office and high BP outside of it. The overall prevalence of WCH is approximately 15% [1]. However, in extreme situations, as in the case of suspected resistant hypertension, the prevalence of WCH reaches 40% [2].

Among the many indications of Ambulatory Blood Pressure Monitoring (ABPM), the main one is to assess patients with suspected WCH , being also indicated to evaluate the white coat effect on hypertensive patients using antihypertensive drugs, whose BP levels measured in the office remain high despite anti-hypertensive therapy. As the white-coat effect is common among the elderly, this is a group where this assessment is often indicated [3]. A difference in BP has been observed in patients undergoing ABPM when comparing BP between the arms and when the results are compared to those obtained by ABPM. One possible explanation for this difference is the manifestation of the white-coat effect [4]. Another very important fact regarding ABPM is that it shows a higher correlation with the incidence of target-organ injury of hypertension than the simple casual BP measurement [5].

ABPM is also a valuable tool to predict cardiovascular events. Mancia et al. showed that, when compared to normotensive individuals, the risk of cardiovascular mortality increased in elderly patients with WCH. When the WCH group was subdivided into 2 groups, i.e., individuals that had normal BP levels in both types of BP measurements outside the office (true WCH) and individuals that had normal BP values at one type of BP measurement outside the office and another type of measurement with abnormal values (partial WCH), only the latter subgroup showed increased cardiovascular risk. The partial WCH subgroup also showed higher risk of developing sustained hypertension in 10 years than normotensive individuals [6].

The reason why patients with WCH have increased cardiovascular risk when compared to normotensive individuals is that patients with WCH have more alterations in glucose metabolism (including higher risk of becoming diabetic), larger left ventricle and increased risk of becoming hypertensive [4]. Other authors observed, however, that among patients with chronic kidney disease, those with WCH had similar cardiovascular risk when compared to normotensive individuals [7].

WCH is correlated with several clinical and epidemiological factors such as age, as shown in the SKIPOGH study [8]. When compared with pre-hypertensive individuals, patients with WCH are significantly older and have higher body mass index (BMI), higher BP levels, higher carotid intimal-medial thickness, higher carotid-femoral pulse wave velocity, greater augmentation index and lower glomerular filtration rate [9]. When compared to individuals with masked hypertension, those with WCH have less pressure variability [10].

Objectives

The aim of this study is to establish the profile of individuals with suspected WCH submitted to ABPM, assessing gender, age and pressure behavior during monitoring.

Material and Method

Between May 2007 and May 2014, a total of 14216 ABPM tests were performed in our department. Of this total, the indication for evaluation of suspected white coat hypertension occurred in 262 tests, which constitute the study sample. The oscillometric method with Dyna-MAPA equipment was used in the study. The limits considered for normal, borderline and abnormal blood pressure are the following (Table 1) [11].

	24 hours	Awake	Sleep
Normal	BP <125/75	BP <130/85	BP <110/70
Borderline	126-129/76-79	131-139	111-119
Abnormal	BP ≥ 130/80	BP ≥ 140/85	BP ≥ 120/70

Table 1: Normal, borderline and abnormal blood pressure.

Statistical analysis

In order to investigate the distribution of patients within the groups (Normal, Borderline and Abnormal), the chi-square test of equal proportions was used, which provides test statistics and level of significance that guide the interpretations. The Analysis of Variance (ANOVA) was used to analyze the means between the ages of groups to indicate the existence of significant difference in mean age between any pair of the studied groups.

After ANOVA, when there was significant indication, Tukey's test was applied to identify which pairs of means showed the indicated difference. As a prerequisite for using the ANOVA test, the Kolmogorov-Smirnov test was performed to check for normality. When it was not possible to verify the normality of the data, the alternative used was the nonparametric Kruskal-Wallis test (as a substitute for ANOVA) and Mann-Whitney-Wilcoxon test (as a substitute for Tukey's test). The software used for most analyses was R software, version 3.1.0.

Results

The sample consists of 262 patients, 121 (46.2%) men and 141 (53.8%) women (Table 2). The mean age of male patients was 41.9 years and of females, 52.5 years (Table 3).

Variable	Category		Number	%
BP report	Borderline		49	18.70%
	Abnormal	With Nocturnal dipping	60	22,9%
		No nocturnal dipping	53	20,2%
	Normal		100	38.20%
Gender	Male		121	46.20%
	Female	141	53.80%	
Total			262	100.00%

Table 2: Patient frequency by BP report and gender.

Variable	Category	Mean	SD	Median
Gender	Male	41.9	15	40
	Female	52.5	14.1	54
	Total	47.6	15.5	47

Table 3: Mean, Standard Deviation and Median Age of patients by gender.

When comparing the distribution of patients among the three categories of BP report, it can be observed that the largest group of patients was the one with abnormal results (Table 4).

BP report	Number	Percentage
Bordeline	49	19
Abnormal	113	43*
Normal	100	38
Total	262	-
*P<0.001		

Table 4: Proportion of patients by BP report.

Regarding the comparison of the distribution of patients by gender within each of the three BP report categories, a significant difference in proportions was observed between the groups of patients with abnormal and normal reports among patients of different genders. For patients with abnormal report, the proportion of men is significantly higher than that of women. For patients with normal reports, the proportion of women is significantly higher than men. There is no significant evidence to state that there is difference in proportion among genders in the group of patients with borderline report (Table 5).

BP report	Female	Male	Total	χ^2	P value
Abnormal	48(42.5%)	65(57.5%)	113	4.53	0.0333
Borderline	29(59.2%)	20(40.8%)	49	2.61	0.106
Normal	64(64%)	36(36%)	100	14.58	0.0001
Total	141	121	262		

Table 5: Tests for equality of proportions among the genders, by report category.

Regarding the comparison of age of patients within each of the three categories of BP report, there was a significant difference between the mean ages of patients with normal and abnormal reports, and between patients with abnormal and borderline reports. There was no significant difference in age between patients with normal reports and patients with borderline reports (p = 0.8288). It is concluded that the mean age of the patients classified as normal or borderline is significantly older than that of patients diagnosed as abnormal (Table 6).

Category	Mean	SD	Median
#Borderline	49.6	14.4	51
*#Abnormal	44.7	14.4	45
*Normal	49.9	16.8	52
Total	47.6	15.5	47
*p=0.0155 #p=0.03			

Table 6: Mean, Standard Deviation and Median age of patients per report.

Discussion

WCH is seen as an intermediate phenotype between normotensive and persistent hypertension and, therefore, it requires regular monitoring and use of nonpharmacological measures [12]. In a series of 6458 patients from 5 different populations selected for the "International Database of Home Blood Pressure in relation to Cardiovascular Outcomes", the cardiovascular risk of patients with WCH was found to be 42% higher than that of normotensive individuals.

However, the risk was not different when comparing treated patients that had increased blood pressure in the office and normal pressure at home (the "white coat effect") with patients that had normal pressure in the office and at home [13]. A study of the population of Monza, in Italy, showed that the cardiovascular risk of patients with WCH was two-fold the risk of normotensive ones [14]. When metabolic risk factors such as waist circumference, serum fasting glucose, uric acid and metabolic syndrome were analyzed, the group of patients with WCH also showed a higher incidence of these risk factors than the group of normotensive individuals [15].

In our sample, among those individuals for whom ABPM was indicated and that had a suspected diagnosis of WCH, blood pressure behavior was normal in 38% of them, confirming the diagnostic hypothesis. However, most patients had abnormal blood pressure behavior at the ABPM (43%), and in almost 50% of these, the examination showed absence of nocturnal dipping, a finding that is suggestive of secondary hypertension or target-organ injury, and a condition that worsens the prognosis of hypertensive patients. One could say then, that in most cases, the physicians who requested the examination were "wrong" regarding the diagnostic hypothesis, as most often the patients were actually hypertensive.

Aganval et al. studied the prevalence of WCH in diabetic patients and found it to be 12%. Martin found a prevalence of 15% and a Brazilian study showed a prevalence of 11%. However, our sample consists of individuals referred to ABPM that already had a report of increased BP in the office and, therefore, in whom WCH was suspected, while the other studies studied groups of patients did not necessarily showed BP increase in the office.

The patients in our study were mostly female (64%) and had a mean age (49.9 years) older than patients with persistent hypertension. A study that assessed Chinese diabetic patients showed a prevalence of WCH of 7.36% BHA and demonstrated that female gender, smoking and alcohol consumption were considered independent risk factors for WCH [16].

Conclusion

1) It was demonstrated that most patients with suspected WCH actually had persistent hypertension at the ABPM; 2) A little over a third of patients with suspected WCH had the diagnosis confirmed by ABPM; 3) the standard patient with WCH in our sample was female and mean age of 50 years.

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