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Research Article

Ambulatory Blood Pressure (BP) and Heart Rate (HR), Gender Differences in Cordoba, Argentina

Introduction

BP is changing in the course of age, in both sexes, Systolic BP increases continuously and instead Diastolic BP only rises until age 50-60 years and then stabilizes or drops [1].

The % of hypertensive patients in Argentina is somewhat higher in men than in women at 60 years or so, and after that age, coinciding with menopause, begins to dominate the female, due to hormonal changes and weight gain [2,3].

The mechanisms mediating the more striking age related increase in cardiovascular disease in women than in men are poorly understood, Aging is accompanied by a greater increase in sympathetic traffic in women than in men, independent of menopausal status [4,5].

Outpatient BP averages, obtained by ABPM Ambulatory Blood Pressure Monitoring, are generally less than office values, as in the study in which women had a proportionately higher mean office BP than men (SBP/DBP 115.0 +/- 0.9 office v 110.2 +/- 1.3 mm Hg in men), but in the same study ABPM values in women show 112.3 +/- 0.9 vs 104.3 +/- 1.1 mm Hg in men) (P =0.013) [6,7].

The averages obtained by ABPM have shown a better correlation with prognosis of patients than measurements in office, and allow us to assess and analyze new BP moments, such as night setback, that has also shown great value to determine the prognosis of patients, and allow us to classified patients as dippers and non-dippers, according to BP nocturnal fall is greater or less than 10%. Some studies find that, after adjustment for all other significant covariates, the odds of being a non-dipper did not differ between men and women [8-10].

Our hypothesis is considered important and essential to know the values obtained with ABPM in each geographical area, (our area is Córdoba Argentine) and to analyze whether there are differences between the values in both sexes, soon to draw conclusions that could be useful for everyday medical practice [1,6].

Aim of Study

To describe ambulatory BP and HR characteristics and differences, between both sexes, in a population of Cordoba Argentina

Material and Methods

Analysis of ABPM studies (Meditech device) of the patients of last 3 years, studied in our Institution, each one with at least 70% valid measurements, and at least 1 valid measure per hour [9].

We analized valid 1299 ABPM studies, 62% men, age 54 (range from 15 to 93) years old, without significative age difference between sexes, 61% of men and 73% of women have more than 50 years old. BMI in men 28,5 vs 26,2 in women, overweight or obesity were present in 77% of men and 50% of women ($p<0.05$).

66% were studies to control treated hypertensives, 34% studied for diagnostics, and from these patients the results show that 12% were normotensives and 22% new hypertensives.

Blood Pressure (BP) averages, SD averages as a marker of BP variability, Pulse Pressure and AASI Ambulatory Arterial Stiffness Index, an index that allows us an approach to the concept of arterial stiffness, both relate to the prognosis of the patients, were also analyzed [11,12].

HR night decline was also identified as a marker of increased cardiovascular risk events, so we've reviewed in our group of patients [9].

Results

BP analisis

Only 40% of treated hypertensives have normal ambulatory BP values. (Day BP ≤ 135/85 and Night BP≤ 120/70 mmHg).

We can observe in the next Table the BP results in both of sexes (Table 1).

SBP: systolic, DBP diastolic, MBP: mean, PP pulse pressure, d: day, n: night. N: number of patients.

No differences of sex was observed in BP variability (SD of the mean), nor in Ambulatory Arterial Stiffness Index (AASI: 1- slope DBP/SBP).

After that, we selectioned and studied a more homogeneous group, all treated hypertensives, between 45 and 60 years old. N:295 (190 men and 105 women).

In next Table we can observe the BP differences in this selected group (Table 2)

Hypertensives women between 45 and 60 years old, show higher SBP variability (SD of the mean) 12,7 vs 11,70 in men (p 0.014), and also higher ambulatory arterial stiffness index (AASI) than men of the same group (0,44 vs. 0,37, p: 0,0001). BP nocturnal dip was similar in both sexes.

HR (Heart Rate) analisis

1) It can be observed a negative but weak correlation between age and ambulatory HR (r -0.18, p< 0.01)

2) The % of nocturnal dip of HR was

Groups	N	Mean	SD..
Treated Controled	344	9,24%	8,14
Treated no controled	527	8,36%	8,43
Normotensives	156	10,59%	8,43
New hypertensives	277	10,75%	8,51

Treated and no controlled patients have less HR nocturnal dip than controlled ones (p<0.04)

3) The HR differences between the sexes is shown in the next Table. We analized separately patients treated and no treated, and with and without BB: Betablockers (Table 3).

Discussion

The databases that describe normal limit values, are based on outpatient values, that correlate well with those obtained in offices, but we have no descriptions of the differences between the sexes in various parameters that can get from ABPM, specially of major groups with different tensional situations (normotensive, hypertensive patients treated or untreated, etc) in our geographic region [13].

Systolic pressure is lower in premenopausal women than in age-matched men, but underlying alterations are not well characterized, although there is some evidence that interactions between sex hormones and the kidneys could play a role [14]. Aging and body size alter arterial function, influencing pressure wave propagation and amplification in peripheral and central arteries.

Premenopausal women had lower brachial and ankle systolic pressures than age-matched men, whereas the ankle-arm pressure index was higher in men. In the overall population the ankle-arm index was positively correlated with body height (19). Carotid systolic pressure was similar in women and men, with an increased effect and earlier return of wave reflections in women. The effect of wave reflections was inversely correlated with body height and positively associated with aortic tapering, which was increased in women; these features could explain the pulse pressure differences in our study [4].

Shorter body height in women results in less peripheral systolic pressure amplification, with lower peripheral but not central systolic pressure. After menopause, arterial distensibility is similar to that of age-matched men, and does not compensate for smaller body size, resulting in a persisting increased effect of wave reflections in central arteries.

The results of our study suggest a predominance of sympathetic vascular regulation in men compared with a dominant parasympathetic influence on heart rate regulation in women, aging is accompanied by a greater increase in sympathetic traffic in women than in men, independent of menopausal status. Sympathetic neural mechanisms may contribute importantly to the more marked influence of age on blood pressure and cardiovascular disease in women [4,5,15].

The response to salt in pre- and post-menopausal women, and in particular the influence of exogenous and endogenous female sex

Table 1:

	SBP d	SBP n	DBP d	DBPn	MBPd	MBP n	PPd	PPn
Men N:804	133,13 S.D.12,12	117,58 S.D.13,66	81,21 S.D.9,63	67,42 S.D.9,43	98,54 S.D.9,32	84,13 S.D.9,96	51,86 S.D.10,34	50,27 S.D.10,07
Women N:495	130,41 S.D.13,63	115,26 S.D.14,46	76,11 S.D.9,46	63,76 S.D.8,82	94,25 S.D.9,48	80,91 S.D.9,64	54,19 S.D.11,71	51,56 S.D.11,38
P<	0,0003	0,0037	<0,0001	<0,0001	<0,0001	<0,0001	0,0003	0,0397

Table 2:

	SBP d	SBP n	DBP d	DBP n	MBP d	MBP n	PP d	PP n
Men N:190	134,68 S.D.11,49	117,73 S.D.12,76	85,66 S.D.7,98	70,71 S.D.9,12	102,05 S.D.8,43	86,42 S.D.9,77	49,02 S.D.8,60	47,06 S.D.8,27
Women N:105	133,77 S.D.13,05	116,37 S.D.13,30	81,09 S.D.9,19	67,53 S.D.8,45	98,90 S.D.9,12	83,79 S.D.9,46	52,42 S.D.9,91	48,79 S.D.8,92
P<	0,53	0,39	<0,0001	0,0036	0,0030	0,025	0,0023	0,097

Table 3:

	total Group HR day	total Group HR night	Treated with BB HR d	Treated without BB HR d	Treated with BB HR n	Treated without BB HR n	Nocturnal dip HR %
Men	72,11 ±10,78 N:804	64,90 ±9,83 N:804	66,77 ±9,49 N:226	74,17 ±10,52 N:575	62,51 ±9,59 N:226	65,82 ±9,80 N:575	9.9
Women	74,71 ±10,11 N:495	67,83 ±9,75 N:495	69,10 ±9,12 N:154	77,17 ±9,34 N:339	64,68 ±8,34 N:154	69,15 ±9,80 N:339	9.2
P<	<0,001	<0,001	0,017	<0,001	0,023	<0,001	n.s.

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hormones on renal hemodynamics and tubular segmental sodium handling, have been poorly investigated, but after the menopause, BP tends to become salt sensitive, a pattern that could be due to aging as well as to the modification of the sex hormone profile. These observations provide new insights pertaining to potential mechanisms explaining the lower incidence of cardiovascular disease and progression of renal disease in pre-menopausal women (which tend to disappear with the menopause) [15].

In our study, the differences were repeated in the different groups studied, and given the important number of patients, acquire a meaning suggesting taken into account in the clinic, and to study the hemodynamic differences that could explain these findings [16].

The differences are similar to those obtained in other databases [17,18], from other geographical regions, but our data provide details of the ambulatory blood pressure, still without analyzed the correlation with hemodynamics, sex hormones, or prognostic of patients.

The possibility that BP influences the cardiovascular risk differently according to sex must therefore be considered. While some studies suggest no difference exists, others have shown evidence of an increased risk in women with respect to men despite equal BP. Aortic stiffness and greater early, pulsatile hemodynamic load affect left ventricular concentric remodeling in a sex-specific manner [19].

In this way, it seems that the measurement of ambulatory BP, but not office BP, would mark the differences in the association between BP-gender and cardiovascular risk. It should therefore be investigated the possibility of a different BP goal for women and men, especially by evaluating ambulatory BP [17,18].

Conclusions

- ABPM allow us to diagnose new hypertensives and detect suboptimal control (60% in our group) in treated hypertensives group
- Ambulatory SBP tends to be higher in men
- Ambulatory DBP and Mean BP were statistically significative higher in men
- Pulse Pressure was higher in women
- Ambulatory HR descend with the increase of age
- Ambulatory arterial stiffness index, and BP variability (SD of the mean) , were higher in women
- Women has higher HR, day and night, and these difference also is seen in patients treated with beta blockers.
- More age, less HR.
- Both daily and nocturnal HR were influenced by betablockers (HR day without BB: 75,26 vs. with BB: 67,64 ($p<0,0001$), and HR night without BB: 67,05 vs. with BB:63,25 ($p<0,0001$)..
- BP and HR nocturnal dip was similar in both sexes.

Limitations

This database does not represent the universe of people of Argentina, and has no data from rural areas, but contains the data of a city with intermediate characteristics, similar demographic details that the rest of the country. This study did not make a separation between pre- and postmenopausal women, and no correlation was analyzed with the height of the patient, which is being analyzed and displayed in future presentations. It is a first step to follow patients and collect data on morbidity and mortality, and to analyze hemodynamic and pathophysiological details, that could explain the differences observed between the sexes.

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