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Masked Hypertension Prevalence and Non-Dipping Blood Pressure in Diabetics in a Hospital at Vitória-ES

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Keywords

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Abstract. **(English)**

Bases: The absence of nocturnal descent (AND) and masked hypertension (MH) are associated with a higher risk of developing lesions in target organs. **Objective:** to analyze the prevalence of masked hypertension and the absence of nocturnal descent in patients with type 2 diabetes mellitus (DM2). **Method:** 41 patients with T2DM were included, 20 were normotensive patients who comprised group A, and 21 were hypertensive patients group B, attended from April to November 2014. They performed ABPM, electrocardiogram, biochemical exams. Variables evaluated: sex, age, weight, body mass index, fasting glycemia (FG), glycated hemoglobin (HbA1c) and creatinine. A descriptive analysis and association of the qualitative variables were made by Fisher's exact test. **Results:** Out of the 41 patients evaluated, 68.3% were female, mean age 56.41 years, mean creatinine 0.83 mg / dl, GJ 138.4 mg / dl and HbA1c 7.32%. Only 24.4% of the sample had an ideal weight. In the analysis of group A, 7 patients (35%) presented MH. AND was present in 31 patients, corresponding to 75.6% of the sample. By

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ECG analysis we observed changes in 4 patients in group A and in 5 patients in group B. AND was related to elevation of HbA1c significantly in group B (p = 0.03). **Conclusion:** we concluded that diabetic patients need a better blood pressure assessment with ABPM, since 35% of normotensive patients had MH. A strict control of DM2 is necessary, since we related the alteration of HbA1c with AND in these patients, related to a higher cardiovascular risk.

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Introduction

The first description on masked hypertension (MH) occurred in 1992 by Pickering [1]. This phenomenon is defined as the condition in which the blood pressure (BP) measurement in the doctor´s office is less than 140/90 mmHg. Still, out-of-office values classify these patients as hypertensive[2].

The prevalence of MH in the population is nearly the same as isolated office hypertension about 1 in 7 people with isolated normal office pressure may fall into this category. The high prevalence of MH suggests a need to measure BP outside the office in people with apparently normal BP[2].

On the other hand, the Absence of the Nocturnal Descent (AND) is described as the absence of a decrease of the AP of 10% or less in the nocturnal period. PA generally follows a circadian rhythm characterized by a reduction of its levels at night. This phenomenon is a result of activities carried out during the day and the circadian rhythm of the autonomic and endocrine nervous system. Changes in the circadian rhythm of these systems may result in changes in the nocturnal descent. This type of alteration is commonly found in patients with alterations in the autonomic nervous system and with severe forms of secondary hypertension. The clinical relevance of this phenomenon lies in the fact that AND is associated with increased lesions in target organs, in addition to increasing the incidence of cardiovascular and cerebrovascular events in hypertensive patients[3].

It is known that the autonomic nervous system is the mediator of the circadian cycle of blood pressure variation. Corroborating this hypothesis, AND has been describing in patients with autonomic alterations[3].

Type 2 diabetes mellitus patients (DM2) also have a strong association with increased cardiovascular risk alone[4].

The incidence of AND in patients with DM2 is higher than that of the general population. Thus, ambulatory blood pressure measurement (ABPM) in diabetic patients is considered a significant tool for stratification of cardiovascular risk and to guide therapeutic measures[5].

The objective of this study is to evaluate the prevalence of masked hypertension and the absence of nocturnal descent, associating these data with fasting glycemia, glycated hemoglobin and BMI in type 2 diabetes mellitus patients.

Method

The current study was performed with patients from the outpatient clinics of the endocrinology and cardiology departments of Santa Casa de Misericórdia de Vitória Hospital (SCMVH) during the period of January 2014 and December 2014.

It were included patients with type 2 diabetes mellitus, non-insulin users, confirmed by glycemia and / or glycated hemoglobin A1c (HbA1c), with the age group of 18 to 75 years of both sexes.

Patients were excluded from study if they presented type 2 diabetes mellitus on insulin; if they were younger than 18 years or older than 75 years; and also if patients presented stage 3 or 4 chronic renal failure.

The study was approved by the Research Ethics Committee of the institution under No. 22417013. All patients signed the Informed Consent Term.

A total of 41 patients were evaluated, divided into two groups: A and B. Group A consisted of patients with T2DM and normotensive patients, whereas Group B patients with DM2 and hypertension (AH) 140/90 mmHg and referring to office measurement.

All of the patients underwent the same preliminary procedure: clinical anamnesis; physical examination with mechanical weighing and BMI calculation (18.5 - 24.9: adequate, 25.0 - 29.9: overweight, 30.0 - 34.9: obesity grade I, 35.0 - 39, 9: obesity grade II;> 40: obesity grade III), FG and HbA1c dosage for evaluation of the glycemic profile; and urea and creatinine for evaluation of renal function.

The patient data (age, gender, BMI, biochemical variables), and other data, were descriptively analyzed with the purpose of characterizing the sample. Statistical analysis was performed using the SPSS

An electrocardiographic evaluation was achieved (rhythm analysis, branch blocks, overload and ischemia), the electrocardiograph used had 3 channels, 12 leads, interpretative report AT1, manufacturer Schiller.

Classic unipolar, bipolar and precordial leads were registered in the supine position with a velocity of 25mm / s and standard calibration (N), and it was complemented with the record of the D2 lead at the same velocity. The BP measurement was done by means of a mercury sphygmomanometer after a rest of 10 minutes, and following the recommendations of the VI Brazilian Direction of Hypertension. Afterwards, 24-hour ambulatory blood pressure monitoring (ABPM) was performed to assess pressure variations during sleep and wakefulness by the DynaMAPA device, version 5.0.382.110, Cardios manufacturer. Dyna-MAPA is a blood pressure monitor that remains installed in the patient during a period of 24 hours, performing periodic measurements of the blood pressure in its systolic and diastolic values, besides the heart rate, recording the values in its memory, being the reading of the results achieved through the DynaMAPA program. Normal BP values were considered to be less than or equal to 130/85 mmHg for the waking period and less than or equal to 110/70 mmHg in the sleep period, based on the V Ambulatory Blood Pressure Monitoring Guidelines (ABPM) of SBC33. The patients who complained of discomfort of BP measurement during sleep were submitted to a new examination to avoid possible bias in the analysis.

Biochemical tests were performed by the Institution's laboratory.
Version 22 program. A descriptive analysis and an association of qualitative variables were made using Fisher's exact test, due to the expected values of less than 5 (five) in

the cascades, considering the level of significance lower than 5%.

Results

Forty-one patients participated in this study. Of those, 20 were normotensive and were included in group A and 21 hypertensive patients underwent antihypertensive therapy, comprising group B. The mean age was 53.1 years for group A and 59, 57 years for group B according to the table below. Of the total, 28 (68.3%) patients were female and 13 (31.7%) were male, based on Table 1.

TABLE 1 – Mean age, in years and gender comparing groups A and B

	SEX		**AGE**	**SD**
	M	F		
GRUP A	6 (30%)	14 (70%)	53,1	7,677
GRUP B	7 (33,3%)	14 (66,7%)	59,5	8,6
TOTAL	13 (31,7%)	28 (68,3%)	56,4	

Source: Authors

*SD: Standard Deviation

For the main anthropometric evaluations analyzed, 31 (75.6%) patients presented BMI from the classification of overweight to that of obesity grade III and were characterized as altered BMI. Of these, 14 (45.2%) were of group A and 17 (54.8%) of group B (Table 2).

TABLE 2 – Comparison between BMI of groups A and B (kg/m^2)

	BMI	
	Normal	Altered
GROUP A	6 (30%)	14 (70%)
GROUP B	4 (19%)	17 (81%)
TOTAL	10 (24,4%)	31 (75,6%)

Source: Authors

The average fasting blood glucose analyzed in the study was 138.4 mg / dl, and in 30 (73.2%) patients it was above the proposed target, of these, 14 (46.7%) patients were of group A and 16 (53.3%) of group B (Table 3).

TABLE 3 – Comparison between fasting blood glucose in groups A and B

	Fasting Glycemia	
	Normal	Altered
GROUP A	6 (30%)	14 (70%)
GROUP B	5 (23,8%)	16 (76,2%)
TOTAL	11 (26,8%)	30 (73,2%)

Source: Authors

In the analysis of glycated hemoglobin fraction A1c, the mean was 7.32% and of the 41 evaluated patients, 23 (56.1%) had altered glycated hemoglobin. By group evaluation, 10 (50%) patients in group A and 13 (61.9%) in group B presented this alteration (Table 4).

TABLE 4 – Comparison of A1c glycated hemoglobin values in groups A and B

	HbA1c	
	Normal	Altered
GROUP A	10 (50%)	10 (50%)
GROUP B	8 (38,1%)	13 (61,9%)
TOTAL	18 (43,9%)	23 (56,1%)

Source: Authors

A total of 20 patients analyzed in group A, 7 (35%) presented HM, 5 (71.4%) patients had HbA1c and BMI alteration, and 4 (57.1%) fasting blood glucose alteration (Tables 5.1 and 5.2).

TABLE 5.1 – Prevalence of masked hypertension in group A

	MH	
	Frequency	Percentage
Yes	7	35%
No	13	65%

Source: Authors

TABLE 5.2 – Analysis of variables: HbA1c, BMI and FBG (Fasting Blood Glucose) in hypotension masked in group A patients

MH			
		Sim	p VALOR
HbA1c	Normal	2 (28,6%)	0,35
	Altered	5 (71,4%)	
BMI	Normal	2 (28,6%)	1
	Altered	5 (71,4%)	
FBG	Normal	3 (42,9%)	0,613
	Altered	4 (57,1%)	
TOTAL	7		

Source: Authors

*pValue: statistical significance

Comparing AND from group A with group B, there was no statistical significance in the difference between both groups (Table 6.1).

Correlacionando a ADN do grupo A com o grupo B, não houve significância estatística na diferença entre os dois grupos (Tabela 6.1).

TABELA 6.1- Comparação entre ADN do grupo A x grupo B

	Grupo A	Grupo B	TOTAL	p Valor
ADN	17 (85%)	14 (66,7%)	31 (75,6%)	0,277
DN	3 (15%)	7 (33,3%)	10 (24,4%)	
TOTAL	20 (100%)	21 (100%)	41 (100%)	

Fonte: Elaborada pelos autores.

*pValue: statistical significance

The absence of nocturnal decrease was present in 31 (75.6%) patients in the study. Among them, 17 were of group A and 14 of group B.

When comparing the patients above-mentioned with the HbA1c values obtained, it was observed that 8 (47.1%) patients in group A and 12 (85.7%) in group B were out of the proposed goal. When FG values were evaluated, a change was observed in 13 (76.5%) patients in group A and 11 (78.6%) in group B. In respect to BMI with

ND, 11 (64.7%) patients in group A and 12 (85.7%) in group B presented high values of this index. Concerning renal function, there were no changes in creatinine values in patients with AND, with reference values being considered, ≤1.3 for men and ≤1.2 for women (Table 6.2).

TABLE 6.2 – Comparison between AND the variables: glycated hemoglobin, fasting glycemia, BMI and creatinine.

AND					
		Group A	p VALOR	Group B	p VALOR
HbA1c	Normal	9 (52,9%)	1	2 (14,3%)	0,03
	Altered	8 (47,1%)		12 (85,7%)	
FG	Normal	4 (23,5%)	0,202	3 (21,4%)	1
	Altered	13 (76,5%)		11 (78,6%)	
BMI	Normal	6 (35,3%)	0,521	2 (14,3%)	0,574
	Altered	11 (64,7%)		12 (85,7%)	
Creatinina	Normal	17 (100%)	-	14 (100%)	-
	Altered	0 (0%)		0 (0%)	
TOTAL		17 (100%)		14(100%)	

Source: Authors

*pValue: statistical significance

In the electrocardiographic evaluations of group A, 4 (20%) patients presented alterations, such as: left atrial overload, right bundle branch block and ventricular repolarization alteration. These 4 patients had AND (Table 7 and 9). In group B, 5 (23.8%) patients presented ECG changes, among them: left atrial overload, left ventricular hypertrophy, right bundle branch block, left bundle branch block and ventricular repolarization alteration, considering that 4 (80.0%) had DNA (Table 8 and 9).

TABLE 7 - EGG in group A

	ECG	
	Frequency	Percentage
Normal	16	80%
Altered	4	20%
Total	20	100%

Source: Authors

TABLE 8 - EGG in group B

	ECG	
	Frequency	Percentage
Normal	16	76,20%
Altered	5	23,80%
Total	21	100%

Source: Authors

TABLE 9 – Comparison between EGG alteration and absence of nocturnal descent

ECG Altered			
AND	Yes	Group A	Group B
		4 (100%)	4 (80%)
	No	O (0%)	1 (20%)
Total		4 (100%)	5(100%)

Source: Authors

Discussion

Diabetes mellitus and systemic arterial hypertension are interrelated diseases that predispose the development of serious cardiovascular complications and lesions in target organs, which may be aggravated by the presence of MH. Thus, it is worth noting that the characteristics of MH may be present in a large proportion of these patients and may not have a confirmed diagnosis due to the unavailability of MAPA equipment in a large part of public health services[6-11].

An additional relevant factor related to patients with T2DM, both hypertensive and normotensive, is that, in some of them, studies point to an absence of pressure decrease in the sleep period.

Its absence is straightly associated with the development of lesions in target organs and to the increase of mortality in several contexts. Within the pathophysiology of DM2, it is conjectured that hyperglycemia alters the circulating plasma volume, and that it may interfere with renal hemodynamics and blood flow distribution, altering the BP of PA[12,13].

In the current study 41 patients were divided into 2 groups. Group A of normotensive and diabetic type 2 (mean age of 53.1 years) and group B of diabetics and hypertensive patients in treatment (mean age of 59.57 years), thus observing a pattern in patients who accumulate the two comorbidities in comparison with the ones who were only diabetics, although there was no statistical significance between the groups. The mean FG and HbA1c values were 138.4 mg / dl and 7.32%, respectively, values above the control goals proposed by the Brazilian Society of Diabetes (<130 mg.dl and 7%). These data are equivalent to 30 (73.2%) patients with FG change and 23 (56.1%) patients with HbA1c alteration, demonstrating the difficulty of achieving glycemic goals in DM2 patients[14].

We may suggest that the decompensation of DM2 favors the pressure change, demonstrated by AND in this case. Anthropometry revealed that 31 patients had a BMI classification from overweight to grade III obesity. This situation corroborates the studies that relate obesity directly to hypertensive events and the lack of control of the glycemic variables analyzed in the study.

In ABPM assessment, we noted that 35% of the patients in group A presented MH. The predominance of MH reported in the literature is 8-20% in non-diabetic patients[15]. In other studies with a greater number of samples, similar predominance of MH was found in patients with DM2, as observed by Franklin et. al., that out of 229 normotensive diabetic patients, 67 patients (29.3%) had MH. Close values were also found by Leitão et. al., who noted a prevalence of 30% of MH in diabetics[16,17].

This study pointed out that patients with MH have a higher ventricular hypertrophy, increased intima-media thickness and a loss in arterial distensibility when compared to patients without this alteration. When MH is associated with T2DM, strict control of these two factors is essential to reduce unfavorable outcomes in the long term[2.]

Concerning the AND, Fogari[18] noted that diabetic patients presented a higher prevalence of lowering abnormalities in relation to non-diabetics, but that there was no difference when compared to diabetic / hypertensive groups / diabetic patients[41]. Following the same line of this study Alison et. al. pointed out that the prevalence of AND in hypertensive and diabetic patients (DM 1 and 2) is approximately 50%, a relatively important value when compared to the AND of only hypertensive patients, which was approximately 10%, thus showing the need to track better the diabetic patient[19].

Throughout our study 75% out of the total population presented AND. In group A, 85% (17 of 20 patients) and in group B this value was approximately 66.6% (14 of 21 patients). Furthermore, when we analyzed the presence of AND related to HBA1c levels, we obtained an association with statistical significance in group B (P <0.03).

DM2 was straightly related to AND, regardless of whether the patient presented hypertension or normotension as demonstrated in our study. Therefore, we believe that antihypertensive therapy may represent an important contribution in therapy for normotensive and diabetic patients with AND.

Going through the identification of lesions in target organs, we did not find alteration of the renal function, through the serum creatinine dosage, associated with MH and AND.

Regarding the evaluation of cardiac lesions, we noticed that 4 patients from group A (20%) and 5 from group B (23.8%) had electrocardiographic changes without statistical difference between the groups. This may be justified by the small sample size.

Conclusions

In conclusion, diabetic patients need a better blood pressure assessment with ABPM to diagnose hypertension, since 35% of patients classified as normotensive were actually hypertensive.

A strict control of DM2 should be taking into consideration, since we relate the alteration of HbA1c with the absence of DN in these patients that is related to a higher risk of target organ damage.

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