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Short Communication

Influence of the emotional alterations in the arterial stiffness index and cardiovascular risk of pre-hypertensive patients.

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4. Acquisition of funds: ASM, MESH, ELG, APS, MEGC, JCAA and JAC

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6. Methodology: MEGC, JCAA and JAC

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Abstract

Purpose: To determine the influence of emotional alterations in the arterial stiffness index and cardiovascular risk of pre-hypertensive patients.

Methods: A cross-sectional study was carried out in 48 pre-hypertensive patients. Emotional alterations, global cardiovascular risk and arterial stiffness index were evaluated. The PPG technique was used to record the arterial pulse wave in the first finger of the lower right limb, using the ANGIODIN® digital plethysmograph.

Results: Pre-hypertensive patients with emotional alterations had major Weight, Body Mass Index, systolic blood pressure, diastolic blood pressure and arterial stiffness index with respect to patients who did not find emotional alterations. In pre-hypertensive patients, 58.3% presented a positive Cornell test, 39.6% of them female, and 18.8% male. There was a significant relationship ($p<0.001$) between the presence of emotional disturbances and moderate cardiovascular risk.

Conclusions: Emotional alterations in pre-hypertensive patients is associated with an increase in arterial stiffness and an increased global cardiovascular risk.

Keywords: arterial stiffness, emotional alterations, pre-hypertensive patients, cardiovascular risk

1- Introduction

Investigation of the physiological correlates of psychological stress is of interest in relation to the putative impact of stress in the etiology of cardiovascular disease and hypertension [(1)]. Among the psychological factors that most influence blood pressure (BP) control are depression, chronic anxiety disorder and panic attacks. There are higher percentage of patients with depression among subjects suffering from resistant arterial hypertension and a positive correlation between grade of anxiety and BP values [(2)]. In early stages of the hypertension elicits a more dramatic pressor response to mental stress compared with normotensive subjects [(3)]. A recent review [(4)] on emotional hypertension (EH) highlights the need that future studies may also investigate individuals at high risk of developing EH, such as individuals with prehypertension or individuals with a genetic risk. More research is needed in this area to specify the role that responses associated with stress play, mainly negative emotions in the development of high blood pressure.

Aim: To determine the influence of emotional alterations in the arterial stiffness index and cardiovascular risk of pre-hypertensive patients.

2-Methods

A cross-sectional descriptive study was carried out in 48 pre-hypertensive patients (30 women) from the clinic 2 of the "Josué País García" Polyclinic in Santiago de Cuba. The pre-hypertensive state was according to The 2018 European Society of Cardiology/European Society of Hypertension and 2017 American College of Cardiology/American Heart Association Blood Pressure Guidelines based in you write it in code of blood pressure [(5)]. The study protocol was approved by the ethics committee for research in human subjects of Universidad de Ciencias Médicas de Santiago de Cuba. Written informed consent was obtained from all the subjects before enrollment in the study.

Exclusion criteria included history of cardiovascular disease or any condition that would require medication that might affect the cardiovascular system (e.g., high blood pressure, asthma, oral contraception), drug or alcohol abuse, history of mental illness and unwillingness to not smoke within 12 hr prior to the session.

Emotional alterations with the Cornell Index test[6], the global cardiovascular risk from the Framingham model [7] and the calculation of lower limb arterial stiffness index [8] from the contour of the pulse wave were evaluated. At the beginning of the Photoplethysmography (PPG) recording session in the morning (08:30-12:00 am), the participants sat in a comfortable chair, in a dimly lit room with controlled temperature between 24-27 °C and were allowed to rest for 10-15 minutes to adapt to local condition and the blood pressure was taken with a certified Sphygmomanometer and stethoscope.

The PPG technique was used to record the arterial pulse wave in the first finger of the lower right limb, using the ANGIODIN® digital plethysmograph, which captures the volume variations by the reflection method, with an 850 nm and 3.5 mA photodiode. The PPG signal is then passed to an analog bandpass filter, from 0.1 Hz to 15 Hz (Butterworth 5th order filter) and was digitized at a resolution of 8 bits and at 106 samples per second. The recorded data was transmitted, processed and archived using its VAPLET® auxiliary software. The software allows to export the arterial pulse wave, marked beat by beat, and then be separated and processed individually by another system. The arterial stiffness index was used the model proposed by Pascau in 2011 [9].

Continuous data are expressed as the mean ± SD. A comparison between two groups was performed using the nonparametric means test (Mann-Whitney U test) for continuous variables and using the chi-squared test for categoric variables. Statistical analyses were performed using JASP Team (2020). JASP (Version 0.13.1) [Computer software].

3-Results

Table 1: Relation between the emotional alterations and patients characteristics.

Variables	Emotional Alteration		Effect size d (Power)	p-value
	Positive (n=28) X±SD	Negative (n=20) X±SD		
Height	1.66 ±0.103	1.61 ± 0.111	0.46 (0.32)	*0.143*
Weight	71.3 ±10.1	61.5 ±12.6	0.85 (0.79)	*0.007*
BMI	25.6 ± 2.5	23.3 ± 2.9	0.84 (0.79)	*0.007*
SBP	126.2 ±8.6	117.5 ±11.3	0.86 (0.80)	*0.007*
DBP	82.6± 5.9	77.6 ±6.7	0.79 (0.73)	*0.011*
Pulse pressure	43.7 ± 6.5	39.9 ± 8.5	0.50 (0.37)	*0.102*

Arterial stiffness index	7.03± 2.5	5.8 ±1.0	0.64 (0.68)	*0.034*

The pre-hypertensive patients with emotional alterations had major Weight, Body Mass Index (BMI), systolic blood pressure (SBP), diastolic blood pressure (DBP) and arterial stiffness index with respect to patients who did not find emotional alterations.

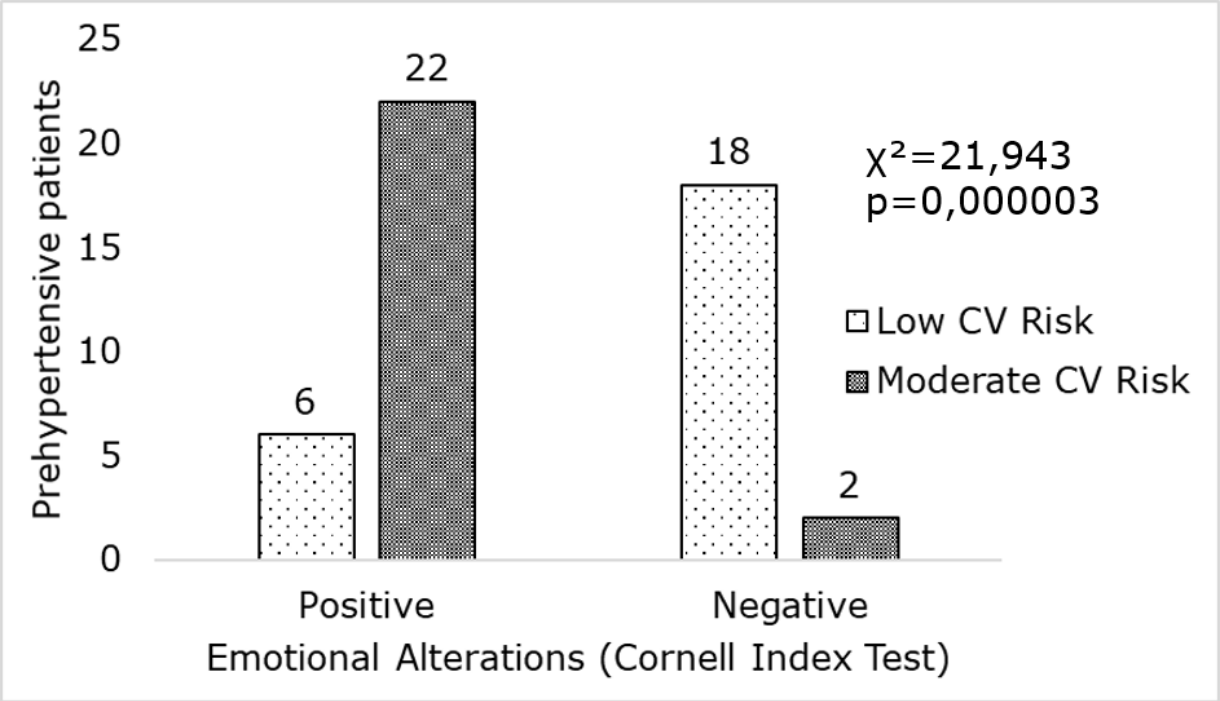

Figure 1: Relation between the emotional alterations and the levels of Cardiovascular (CV) Risk in pre-hypertensive patients.

In pre-hypertensive patients, 58.3% presented a positive Cornell test, 39.6% of them female, and 18.8% male. There was a significant relationship ($p<.001$) between the presence of emotional disturbances and moderate cardiovascular risk.

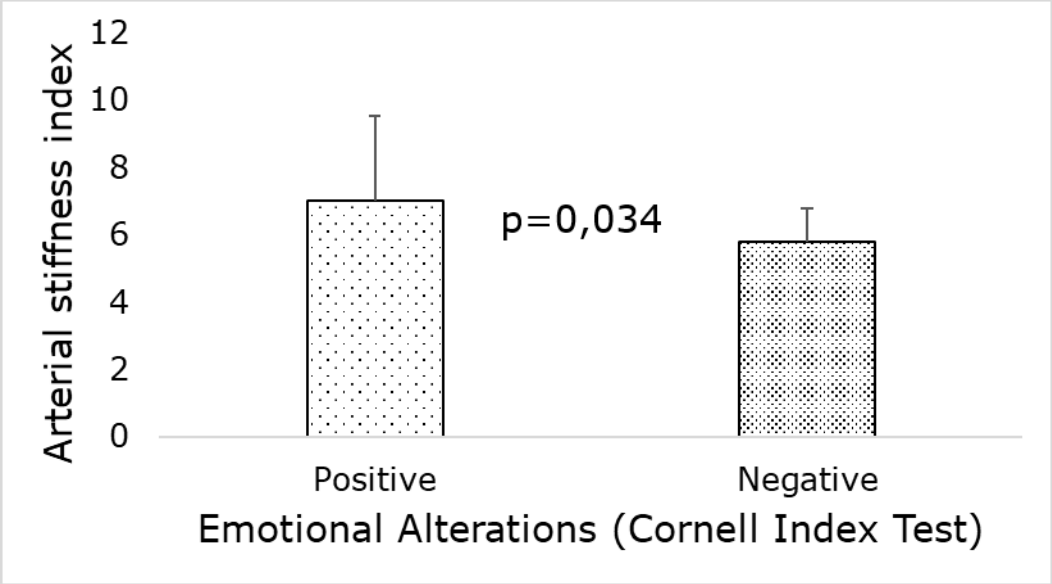

Figure 2: Influence of emotional alterations in the arterial stiffness index of pre-hypertensive patients.

The pre-hypertensive patients with emotional alterations presented a significant increase (p=.031) in the arterial stiffness index (7.04 ± 2.59) with respect to the patients who did not find emotional alterations (5.85 ± 1.00).

4-Discution

In this study, emotional alterations were associated with a significant increase in Weight, BMI, SBP, DBP and arterial stiffness index. These findings are consistent with the results of [10] in which, acute stress induction, no significant changes in autonomic function were observed, but arterial stiffness significantly increased. However, psychosocial stress in adolescence can cause sympathetic activity, which increases resting systolic blood pressure and heart rate, thereby possibly leading to arterial stiffness [11].

Several studies suggested that social relationships and negative emotional traits play a role in cortisol secretion [11,12]. Besides, less supportive social relationships and negative emotional traits may affect central adiposity via effects on neuroendocrine function [11]. Increased secretion of cortisol is known to cause abdominal fat accumulation and result in visceral obesity [13]. It is well known that the negative emotional states can make the most vulnerable individual to various diseases [11,12].

In the present investigation, has been observed that the pre-hypertensive patients with emotional alterations have bigger probability to present greater cardiovascular risk than pre-hypertensive patients without emotional alterations. The scientific investigation has established that, the tendency to show exaggerated cardiovascular response to the stress

predict the later development of essential hypertension [14,15]. The aforementioned response include the arterial pressure elevations that are higher of what it takes for a motive reaction adaptive to possible stressors[16]. Gianaros in 2012[14] demonstrated in healthy individuals a relation between the reactions of increased blood pressure and the exaggerated neural activation at the limbic regions and of the brainstem in response to mental stress. On the other hand, [4] have also suggested that aberrant emotion regulation in EH may share common neurocognitive mechanisms with stress and anxiety, playing a role of the thalamic pulvinar nucleus. The people with essential hypertension, in comparison with normotensive, show significantly higher levels of anxiety and anger-hostility coping thoughts as well as an almost significant trend toward a higher frequency of hostile and physically aggressive thoughts [17]. The results from the present study suggest that the emotional alterations constitute an independent and additional factor for cardiovascular risk in pre-hypertensive subjects.

5-Conclusions:

The presence of emotional alterations in pre-hypertensive patients is associated with an increase in arterial stiffness and an increased global cardiovascular risk.

Study limitations

First, it was a cross-sectional study and the temporal or antecedent consequent relationships between risk factors and the development of prehypertension cannot be established in such studies. Another limitation is that participants in our study were probably better adjusted and not representative of the pre-hypertensive patients. Consistent with this possibility is that the pre-hypertensive patients who did not participate in the follow-up session had higher anger, anxiety and hostility scores.

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