

Comorbilidad afectiva en personas con hipertensión arterial: un estudio de caso-control en adultos dominicanos

**Zoilo Emilio García-Batista; Kiero Guerra-Peña; Antonio Cano-Vindel;
Solmary Xiomara Herrera-Martínez; Pablo Ezequiel Flores-Kanter; Leonardo Adrián Medrano**

How to cite this article:

García-Batista, Z.E., Guerra-Peña, K., Cano-Vindel, A., Herrera-Martínez, S.X., Flores-Kanter, P.E. & Medrano, L.A. (2020). Affective comorbidity in patients with hypertension: a case-control study on adults in the Dominican Republic. *Acta Colombiana de Psicología*, 23(1), 205-215. doi: <http://www.doi.org/10.14718/ACP.2020.23.1.10>

Recibido, febrero 13/2019; Concepto de evaluación, abril 1/2019; Aceptado, mayo 25/2019

Zoilo Emilio García-Batista*

Pontificia Universidad Católica Madre y Maestra, Santiago de los Caballeros, República Dominicana
ORCID: <https://orcid.org/0000-0002-0353-4804>

Kiero Guerra-Peña

Pontificia Universidad Católica Madre y Maestra, Santiago de los Caballeros, República Dominicana
ORCID: <https://orcid.org/0000-0003-3315-9459>

Antonio Cano-Vindel

Universidad Complutense de Madrid, Madrid, España
ORCID: <https://orcid.org/0000-0002-5449-5454>

Solmary Xiomara Herrera-Martínez

Universidad Arturo Michelena, Valencia, Venezuela
ORCID: <https://orcid.org/0000-0002-9353-8277>

Pablo Ezequiel Flores-Kanter

Universidad Siglo 21, Córdoba, Argentina
ORCID: <https://orcid.org/0000-0002-6712-779X>

Leonardo Adrián Medrano

Pontificia Universidad Católica Madre y Maestra, Santiago de los Caballeros, República Dominicana
ORCID: <https://orcid.org/0000-0002-3371-5040>

Resumen

En la literatura científica se encuentra un gran número de controversias y resultados dispares a la hora de explicar la relación entre la hipertensión arterial y algunas variables vinculadas a la afectividad negativa, como la depresión, la ansiedad y la ira. Teniendo esto en cuenta, en la presente investigación se planteó como objetivo principal analizar medidas de ansiedad, depresión e ira en personas adultas que padecen de hipertensión arterial (HTA). A partir de un diseño de caso-control, se contrastaron dos grupos, uno conformado por personas con HTA ($n = 50$) y otro de control equiparado en número de casos, edad y sexo. A nivel general, el grupo de HTA mostró mayores niveles de depresión —en su dimensión somática— y de ira-rasgo —en su dimensión de temperamento—. Asimismo, las personas con HTA presentaron síntomas de irritabilidad y pérdida de energía —síntomas depresivo-somáticos—, además de que tendían a enojarse con facilidad o rápidamente —síntomas de temperamento de ira—. El abordaje de estos factores psicológicos comórbidos resulta de relevancia dado que en estudios precedentes ha demostrado aumentar la adherencia al tratamiento médico en pacientes que han sido diagnosticados con hipertensión o patologías similares.

Palabras clave: hipertensión, depresión, ansiedad, ira, comorbilidad.

* Santiago de los Caballeros, República Dominicana. C. P.: 51000. zgarcia@pucmm.edu.do

Affective comorbidity in patients with hypertension: a case-control study on adults in the Dominican Republic

Abstract

Research on the relationship between hypertension and variables linked to negative affectivity has given rise to divergent findings and differing interpretations. The main objective of this paper was therefore to shed light on the issue by analyzing measures of depression, anxiety and anger in adults suffering from hypertension (HTN). Based on a case-control design, a group of individuals suffering from HTN (n=50) was compared with a control group of the same number of cases, age and sex. In general, the HTN Group showed higher levels of depression in its somatic dimension and of trait anger in its temperament dimension. Individuals with HTN presented symptoms of irritability and loss of energy (depressive-somatic symptoms) and propensity to anger easily (temperament anger symptoms). It has been demonstrated in preceding researches that addressing these comorbid psychological factors is of importance in increase adherence to medical treatment in patients who have been diagnosed with hypertension or similar pathologies.

Key words: hypertension; depression; anxiety; anger; comorbidity.

Introduction

Arterial hypertension (HTN) is one of the leading risk factors for morbidity and mortality worldwide (Wang et al., 2016). In addition to the high economic costs associated with this chronic medical condition, it is one of the main causes of cardiovascular pathologies such as heart failure and heart attack (Wu et al., 2018). At the global level it is estimated that the number of those at risk of HTN will reach 1.56 million by 2025 (World Health Organization, 2000). Unfortunately, only a few studies address the prevalence of this disease in developing countries (Ploth et al., 2018).

The wide implications of HTN for healthcare systems has brought attention to the risk factors associated with the disorder (Redina & Markel, 2018). The primary causes of chronic high blood pressure remain for the most part unknown (i.e. Primary or Essential HTN; A Global Brief on Hypertension, World Health Organization, 2013). Beyond the influence of biological variables such as obesity and age, factors related to negative affectivity have acquired increasing relevance in explaining the development and persistence of hypertension (Casiglia & Tikhonoff, 2018; Soboka, Gudina & Tesfaye, 2017). Though the precise role of affective variables in HTN is unclear, greater importance is already being attached to comorbid psychological factors as a means of increasing patients' adherence to medication (Amico, Mugavero, Krousel-Wood, Bosworth & Merlin, 2017; Dyussenova et al., 2018; Sanz et al., 2010; Yu et al., 2015).

Among the various dimensions of negative affectivity, attention has been focused on depression, anxiety and anger. In general terms it is hypothesized that individuals who frequently suffer intense states of negative affectivity are more prone to HTN and its associated pathologies (e.g.

cardiovascular disease), or more likely to have chronic high blood pressure (Redina & Markel, 2018). Although a series of experiments has provided evidence in support of this hypothesis (see for example the review by Kaplan & Nunes, 2003 and the meta-analysis by Rutledge & Hogan, 2002), the findings are not consistent. More recent studies have shown for example that in the case of depression there is more evidence against (Bajkó et al., 2012; Uceda, Sanz Fernández, Espinosa López & García-Vera, 2013; Yan et al., 2004) than in support (Meyer, Armenian, Eaton & Ford, 2004) of an association with HTN. In the case of anxiety on the other hand, there are more data in support of (Bajkó et al., 2012; Uceda et al., 2013; Yu et al., 2015) than against (Yan et al. 2004) such association. The findings on anger have been more in favor of (Mushtaq & Najam, 2014; Sahraian et al., 2015; Yan et al., 2004) than opposed (Uceda, et al. 2013) such association between this particular negative affect and HTN.

Explanations for these divergent findings remain a matter of debate, making it difficult to establish whether they are due to methodological issues or to weak associations between the variables (García-Vera, Sanz, Espinosa, Fortún & Magán, 2010; Sorsdahl et al., 2016; Tikhonoff et al., 2014). From a methodological point of view the studies differ widely in terms of the tools used, the subject population, age range, proportion of males/females, the way in which the scores of the variables considered were calculated (e.g. unidimensional vs multidimensional scale), concurrent measurement of affective variables or not, and the type of design applied (i.e. longitudinal vs transverse/control case). Therefore, some methodological distinctions need to be made from these previous evidences.

A first step is to identify the type of design used in previous studies to evaluate the association between variables. This

is important because whereas longitudinal or interventions studies can be used to assess the predictive capacity of affective variables in relation to HTN, cross-sectional or case-control studies do not allow definitive conclusions to be drawn with respect to the causality between the variables involved (Woodward, 2014), and more likely take account of individuals' affective experience after being diagnosed with a chronic disease like HTN (Yu et al., 2015). Another highly relevant aspect for understanding the association between negative affectivity and HTN is whether affective variables were measured concurrently or separately. Commonalities between depression, anxiety and anger could explain the inconsistencies observed in some of the studies (García-Vera et al., 2010). That is, a reported positive association between an affective variable and HTN could be due to the specific action of this variable on the HTN or may simply reflect a correlation with another variable associated with HTN (Suls, 2017). Another possibility is that it is the joint effect (i.e. communality) rather than the individual effect (i.e. specificity) of affective variables that allows explaining the emergence and maintenance of HTN (Suls & Bunde, 2005; see also Woodward, 2014, for an explanation of all these possibilities through Venn diagrams).

To date we have found only two studies that concurrently investigate all of these affective variables (i.e. depression, anxiety and anger) in hypertensive individuals and applying a case-control design (García-Vera et al., 2010; Uceda et al., 2013). Whereas García-Vera et al. (2010) found higher levels of the anxiety and depression dimensions in the HTN group but no difference with respect to anger, Uceda et al. (2013) found that HTN individuals differed only in their level of anxiety. Therefore, it is not possible here either to determine with certainty the proposed relationships between negative affectivity and HTN.

The limitations and inconsistencies surrounding previous studies led us in the present paper to analyze concurrent measures of depression, anxiety and anger with a view to investigating comorbid negative affectivity in individuals with HTN (Rafanelli, Offidani, Gostoli, & Roncuzzi, 2012; Tel, 2013; Soboka et al., 2017). We circumvented the methodological limitations identified in previous studies (García-Vera et al., 2010; Uceda et al., 2013) by using the complete version of the Beck Depression Inventory-II (BDI-II) to measure depression, distinguishing between cognitive, affective and somatic factors; and the State-Trait Anger Expression Inventory-2 (STAXI-2) to measure the main dimensions identified with trait anger (i.e. temperament anger and response/reaction anger). Lastly, we applied the State-Trait Anxiety Inventory (STAI, Guillen-Riquelme & Buéla-Casal, 2015), an instrument that makes it possible

to measure the trait anxiety considering a longer period of time when ask for the anxious symptoms.

In order to arrive at a more precise definition of the common affective components associated with HTN, an analysis will be made that contemplates each specific affective symptom (e.g. irritability) beyond the general dimension (e.g. depression). By comparing the results for the HTN group with those of the control group it is sought to identify the emotional-affective symptomology most characteristic of HTN patients, in turn leading to elucidation of the emotional-affective symptoms implicated in persistent HTN (Tully, Peters, Pérès, Anstey & Tzourio, 2018).

Previous studies have underlined the need to extend investigations to other regions of the world, including Latin America and the Caribbean (Camacho, Echeverría, Barros, Maiz & Rigotti, 2018). Recent guidelines issued by the Pan American Health Organization (Khon et al., 2018) also stress the importance of repeating developed country studies in Central and South America. Undertaking studies on other populations is important since aspects affecting the relationship between HTN and negative affectivity can vary according to the context and culture (Rad, Martingano & Ginges, 2018). The current study is the first to analyze the association between HTN and negative affectivity in the population of the Dominican Republic.

Method

Participants

A total of 100 adults selected by non-probability sampling participated in the study (see the procedural section for more precise details). International criteria were used to define the adult category, considered to include individuals between the ages of 20 and 60 (Ruiz, 2005; Vos et al., 2017). Two groups were compared, the HTN group ($n=50$), comprising individuals suffering from arterial hypertension, and a control group ($n=50$), consisting of the same number of individuals of the same age and sex as the first group. Both groups comprised the same proportion of females (64%) to males (36%) and the ages in both groups ranged from 23 to 60 (M HTN Group=44.72, $DE=10.67$; M Control Group=44.26, $DE=10.13$; ΔM Age=.46, $t=.22$, $gl=98$, $p=.83$).

Instruments

State-Trait Anxiety Inventory (STAI). This instrument measures state and trait anxiety based on 20 multiple choice responses for each, using a 4-point Likert-type scale. For the purposes of the present study, the validated version for

the Dominican population was applied, in which the score presented adequate psychometric properties (α between .83 and .86) and significant correlations with depression (García-Batista, et al. 2017). Only trait anxiety (STAI-T) was measured in the present study, showing optimal internal consistency in the present sample ($\alpha=.83$).

State-Trait Anger Expression Inventory-2 (STAXI-2). The assessment provided by STAXI-2 distinguishes between the experience, expression and control of state and trait anger using a 4-point Likert-type scale composed of 49 elements. Again, the validated version for the Dominican Republic was used. The results showed an acceptable and optimal level of internal consistency (α between .75 y .86) and significant differences between the general population and clinical individuals (García-Batista, et al., 2018). Here as well, only trait anger was considered. Both, temperament anger ($\alpha=.84$) and response/reaction anger ($\alpha=.82$), presented optimal internal consistency in the present sample.

Beck Depression Inventory -II (BDI-II; Beck, Steer & Brown, 1996), a self-report measure based on symptoms described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2000) for measuring severe depression. The version of the inventory used contains 21 items each with 4 response options on a scale of 0 to 3. The validated version of BDI-II for the population of the Dominican Republic was used (García-Batista, Guerra-Peña, Cano-Vindel, Herrera-Martínez & Medrano, 2018) to measure severe depression in general and its cognitive, affective and somatic sub-components. A bifactor model showed the best fit to the validated Dominican Republic data ($\chi^2=541.57$; CFI=.94; RMSEA=.05), with optimal internal consistency values for the general dimension ($\alpha=.89$) and acceptable values for the specific sub-dimensions (Cronbach's α of between .70 y .78). In the present sample acceptable values were found for the scales considered: Cognitive Dimension ($\alpha=.78$); Affective Dimension ($\alpha=.70$) and Somatic Dimension ($\alpha=.77$).

Procedure

A case-control design was used in this study (Woodward, 2014). Individuals suffering from arterial hypertension were selected from medical consultations at the Hospital José María Cabral y Báez, in the city of Santiago de Los Caballeros, Dominican Republic, and those diagnosed with HTN were invited to be referred to the research team. A meeting was then scheduled to briefly clarify the aims of the research, attain the patients' consent and assure the anonymity of the study. The details of the consenting patients were recorded and the STAI, STAXI-2 and BDI-II inventories carried out.

A parallel sample of voluntary individuals with no health problems was then selected to match the number, age and sex of the HTN group. The aims and voluntary, anonymous nature of the study were also clearly explained to this group and the corresponding STAI, STAXI-2 and BDI-2 inventories applied to the verbally consenting individuals.

The present study was approved by the Comité Nacional de Bioética (CONABIOS – National Bioethics Committee) of the Public Health Ministry of Santo Domingo, Dominican Republic (protocol number 028-2014).

Data Analysis

The choice of statistical procedure to verify differences between the two groups was determined by compliance or non-compliance with the assumptions of normality and homoscedasticity. The Kolmogorov–Smirnov Test of Normality and the Levene test for equality of variance (Tabachnick & Fidell, 2007) were used to verify the normality of the data and the homogeneity of variance. As can be appreciated from Tables 1 and 3, the assumptions showed varying degrees of non-compliance. For this reason, it was decided to apply robust moderns' statistics recommended in those cases where the data diverged from the assumptions of normality and homogeneity of variance (Wilcox & Keselman, 2003). In general terms, this group of so-called modern robust tests (e.g. Yuen test; Yuen test with Bootstrap; Percentil-Bootstrap based on estimator M) make no assumptions about the functional form of the probability distribution. (Wilcox, 2012). More specifically, to verify the differences between the groups compared in the present paper, robust measurements of position, the trimmed mean at 10% and the corresponding standard deviation were calculated (Wilcox, 2012). The Yuen Test (also based on a mean trimmed at 10%), one of the most robust tools in cases of non-normality and non-homoscedasticity, primarily in terms of control of type 1 error and maintenance of the potency of the test, was also applied (Ozdemir, Wilcox & Yildiztepe, 2012). The described procedure was used for the general affective dimension level as well as the symptomatic level. The score for specific symptoms was obtained via a Likert-type (i.e. ordinal) scale. According to the literature, both parametric inferential type tests and the modern robust tests proposed in this research can be applied to this type of ordinal scale data (see for example Norman, 2010).

Cohen's d was used to calculate the differences in magnitude of the effect size (Lakens, 2013), using the robust version proposed by Algina, Keselman and Penfield (2005), based on the trimmed mean. The statistical software R (R

Core Team, 2016) and IBM SPSS 20 were used for the statistical analyses.

Results

The exploratory analyses and differences between groups are presented firstly at the level of the general dimensions of Depression, Anxiety and Anger and then at the symptomatic level.

Initial Exploratory and Descriptive Analyses: General Level of Negative Affectivity

Before investigating whether the groups differed in their general levels of depression, anxiety and anger, exploratory analyses were carried out and the corresponding tests of normality applied (See Table 1).

In general terms one can observe a deviation from normality and in some cases non-compliance with the assumption of equality of variance.

Analysis of Differences between Groups at the General Level and for Negative Affectivity: Inference and Effect Size Tests

Table 2 shows the differences between groups using robust statistical methods.

As can be appreciated from the above data, only some of the evaluated dimensions show statistically significant differences, the HTN group having higher levels of Depression in its somatic dimension, and of Trait Anger in its Temperament dimension. The difference between groups in effect size is most strongly evident for the Somatic dimension of Depression. The differences in the

Table 1
Exploratory Analyses at the General Level: Tests for Asymmetry, Kurtosis, Normality and Homoscedasticity

	Descriptive Statistics		Assumptions Tests		Levene Statistic
	With HTN g1/g2	Without HTN g1/g2	With HTN <i>D</i>	Without HTN <i>D</i>	
Depression					
Cognitive	1.13/.41	1.57/1.51	.21**	.28**	2.17
Affective	1.19/-.17	2.51/6.91	.32**	.27**	5.00*
Somatic	.82/1.15	1.38/2.23	.11	.17**	1.58
Trait Anxiety	.58/-.30	.41/-.57	.16**	.12	.54
Trait Anger					
Temperament	1.63/2.22	1.02/.18	.22**	.22**	5.65*
Response/Reaction	.69/-.09	.90/.71	.15**	.14**	.99

Note: * $p < .05$, ** $p < .01$; g1=Asymmetry; g2=Kurtosis; *D*= Statistics from the Kolmogorov–Smirnov Normality Test.

Table 2
General levels of depression, trait anxiety and trait anger between Groups with HTN and without HTN (Control Group).

	Groups		T_y	<i>p</i>	<i>d</i>
	With HTN T-M (SD)	Without HTN T-M (SD)			
Depression					
Cognitive	2.75 (.53)	1.65 (.47)	1.17	.13	.31
Affective	1.80 (.50)	.90 (.24)	1.60	.11	.33
Somatic	7.27 (.71)	4.62 (.53)	2.96	<.01	.61
Trait Anxiety	14.75 (1.30)	12.70 (1.15)	1.17	.24	.24
Trait Anger					
Temperament	8.15 (.46)	6.77 (.32)	2.40	.01	.50
Response/Reaction	11.07 (.58)	9.75 (.44)	1.80	.07	.37

Note. T-M = trimmed mean (mean trimmed at 10%); SD=Standard Deviation; T_y = Yuen's test. Bold type indicates variables that present statistically significant differences.

cases of Somatic Depression and Temperament Anger are of moderate magnitude.

Initial Exploratory and Descriptive Analyses: Symptomatic Level

The differences at the symptomatic level were analyzed for the symptomatic dimension of depression and the temperament dimension of anger, since these were the only dimensions showing statistically significant differences between groups at the general level. As with the dimensional analysis of variables, prior exploratory analyses were carried out and the respective normality and homoscedasticity tests applied (see Table 3).

A deviation from normality can also be observed at the symptomatic level and in some cases non-compliance of the assumption of equality of variance.

Analysis of the Difference between Groups at the Symptomatic Levels of Negative Affect: Inference Tests and Measurement of Effect Size

Table 4 shows the differences found at the symptomatic level between the two groups, applying robust statistical methods.

As can be appreciated from Table 4, the most characteristic symptoms of the HTN Group are irritability ($d =$

.54) and loss of energy ($d = .50$), followed by changes in appetite ($d = .44$) and difficulty in concentrating ($d = .42$) in the case of depressive-somatic symptoms; and angering easily ($d = .50$) and angering quickly ($d = .42$) in the case of temperament anger. For all these symptoms the differences show a moderate effect size.

Discussion

The main aim of the present study was to analyze concurrent measures of depression, anxiety and anger in individuals suffering from HTN and identify the most characteristic affective symptoms in HTN patients. With respect to the first objective, though higher levels are observed overall in the HTN group, statistically significant differences -of moderate effect size- are only found in the cases of somatic depression and temperament anger. With regard to the second objective, the most characteristic symptoms of HTN patients are irritability, loss of energy in the case of somatic depression and angering easily and quickly in the case of temperament anger.

The findings of the present study differ in general from those of the only other two studies we have found in the literature with similar objectives. Only in the case of

Table 3
Exploratory Analysis of Data at the Symptomatological level: Asymmetry, Kurtosis and Normality Tests

	Descriptive Statistics		Assumption Tests		Levene Statistic
	With HTN g1/g2	Without HTN g1/g2	With HTN <i>D</i>	Without HTN <i>D</i>	
Depression: Somatic					
15. Loss of Energy	.62/.18	1.16/1.98	.27**	.30**	.03
17. Irritability	1.64/2.72	2.54/6.06	.32**	.46**	1.86
19. Difficulty in C.	.67/-.53	1.23/1.65	.25**	.32**	2.80
20. Fatigue	.78/-.36	1.41/2.33	.27**	.26**	.96
10. Lose	1.14/.16	1.14/-.35	.36**	.40**	4.11*
11. Agitation	1.37/.77	2.34/5.38	.30**	.41**	3.68
16. Changes in S.H.	.21/-.73	.76/-.01	.23**	.26**	.43
18. Changes in A.	.29/-1.02	1.11/.64	.21**	.28**	.49
21. Loss of S.I.	1.38/1.06	2.19/4.11	.30**	.41**	1.14
Anger: Temperament					
16. I warm up quickly	.98/.21	1.50/2.96	.32**	.30**	.09
17. I have an irrit. temp.	1.28/1.04	.60/-1.70	.28**	.41**	10.92**
18. I am an exalt. person	1.45/1.37	1.03/-.02	.35**	.41**	10.26**
20. I tend to lose temper	1.69/3.40	2.48/8.26	.34**	.43**	4.15*
23. I get angry easily	1.04/.13	1.68/2.72	.28**	.39**	1.96

Note. * $p < .05$, ** $p < .01$; g1=Asymmetry; g2=Kurtosis; *D*=Statistics from the Kolmogorov–Smirnov Test of Normality. Changes in S.H.=Changes in Sleeping Habits; Changes in A.=Changes in Appetite; Difficulties in C.=Difficulties in Concentrating; Loss of S.I.=Loss of Sexual Interest; I have an irrit. temp. = I have an irritable temper; I am an exalt. person = I am an exalted person.

Table 4

Levels of Affective Symptomology Comparison between Groups with HTN and without HTN.

	Groups		T_y	p	d
	With AHT T-M (SD)	Without HTN T-M (SD)			
<i>Depression: Somatic</i>					
15. Loss of Energy	.87 (.12)	.50 (.08)	2.43	.01	.50
17. Irritability	.42 (.08)	.12 (.07)	2.62	.01	.54
19. Difficulty in C.	.80 (.14)	.45 (.08)	2.05	.04	.42
20. Fatigue	.92 (.17)	.55 (.08)	1.87	.06	.38
10. Lose	.50 (.14)	.55 (.20)	.20	.84	.04
11. Agitation	.55 (.18)	.22 (.08)	1.63	.10	.33
16. Changes in S.H.	1.00 (.13)	.65 (.12)	1.87	.06	.38
18. Changes in A.	1.02 (.14)	.60 (.13)	2.13	.03	.44
21. Loss of S.I.	.50 (.12)	.22 (.08)	1.80	.07	.37
<i>Anger: Temperament</i>					
16. I warm up quickly	1.87 (.17)	1.47 (.08)	2.06	.04	.42
17. I have an irrit. temp.	1.55 (.12)	1.32 (.08)	1.46	.14	.30
18. I am an exalt. person	1.42 (.12)	1.30 (.08)	.80	.42	.16
20. I tend to lose temper	1.40 (.08)	1.20 (.07)	1.69	.09	.35
23. I get angry easily	1.77 (.17)	1.30 (.08)	2.40	.01	.50

Note. T-M = trimmed mean (mean trimmed at 10%); SD = Standard Deviation; T_y = Yuen's test. Bold type indicates variables that present statistically significant differences. Changes in S.H. = Changes in Sleeping Habits; Changes in A. = Changes in Appetite; Difficulties in C. = Difficulties in Concentrating; Loss of S.I. = Loss of Sexual Interest; I have an irrit. temp. = I have an irritable temper; I am an exalt. person = I am an exalted person.

depression are our results similar to those of García-Vera et al. (2010). These different findings could be due in part by methodological differences between studies.

In order to measure depression, the present study analyses the complete version of the BDI-II, consisting of 21 items, allowing a distinction between three specific dimensions, whereas the study by Uceda et al. (2013) uses an abbreviated version of the Beck Depression Inventory (BDI-II-SV, Sanz, García-Vera, Fortún & Espinosa, 2005), taking into account only a total score. That makes it more difficult to detect the somatic depression traits identified in the present study (García-Batista et al. 2018).

There are also differences in the instruments applied to measure anxiety. Though the Beck Anxiety Inventory (BAI) used by Uceda et al. (2013) bears certain psychometric similarities to STAI-R, there are notable differences in terms of the constructs to be measured, the content of the items (e.g. symptoms of depression and anxiety that evaluate these) and their capacity to discriminate between anxiety and depression (Sanz, 2014). More precisely, as indicated by Sanz (2014), STAI-R is more suitable than BAI for evaluating the Generalized Anxiety Disorder, covering more than 50% of GAD symptoms, whereas BAI is more suitable for evaluating panic attack, covering

more than 50% of this symptoms. Finally, an important limitation of STAI-R with respect to BAI is the content validity, since 65% of the items in STAI-R also measure symptoms of major depressive disorder (MDD). The two tests measure different symptoms of anxiety and the results of the present study show no evidence that GAD symptoms are characteristic of individuals with HTN. On the other hand, the overlapping depression-anxiety symptoms in the STAI-R scores could explain the lack of differences between the HTN group and the control group (Sanz, 2014). This would also serve to explain why the present results are not consistent with those of other studies that have applied this same instrument (García-Vera, et al. 2010). Finally, the reason for the discrepancies could also lie in the different time scales used to measure the anxiety symptoms. Further research is required to shed light on this aspect.

Both García-Vera et al. (2010) and Uceda et al. (2013) also apply the STAXI-2 test in relation to trait anger, but again, they take the total score into consideration. The present study on the other hand takes the original definition of Spielberger (1991), who draws a distinction between dimensions for trait anger: (a) irritable temperament, which takes account of the general propensity to feel and express anger without any specific provocation; and (b)

response/reaction anger, which refers to the propensity to express anger in response to a specific provocation. In the STAXI-2 psychometric studies it is this bifactorial structure that presents the most favorable evidence (García-Batista, et al. 2018). Furthermore, it has been suggested that the multidimensional measurement of anger is a necessary condition for arriving at more conclusive findings with respect to the link with HTN (Siegel, 1986). As with the measurement of depression, therefore, consideration of sub-dimensions of trait anger would make it more likely to verify differences between groups.

An important novel finding of the present study is the identification of trait depression and trait anger symptoms in persons suffering from HTN. More HTN sufferers presented symptoms of irritability and loss of energy (depressive somatic symptoms) and became more easily and rapidly angry (symptoms of an angry temperament) than individuals in the control group. Although data is lacking on affective symptoms in individuals with HTN, there is evidence that they tend to suffer from depression, with a detrimental impact on their quality of life (Rafanelli, et al. 2012). A correlation has been found both between the symptoms of depression and the duration of the diagnosis of the disorder (i.e. the length of time the patient suffers from the disorder) and between the symptoms and feelings of anger in HTN patients (Tel, 2013). In line with this, Rafanelli et al. (2012) reported that individuals with HTN suffer depression and irritability. This affective comorbidity can be explained by the fact that people who have been diagnosed with chronic medical conditions such as hypertension find it difficult to adapt their lifestyle, their work and their aspirations accordingly (Soboka et al. 2017). Thus, the diagnosis of HTN could trigger the appearance of these symptoms at the sub-clinical level but with negative repercussions on physical health (Rafanelli et al. 2012). The hypothesized association between affectivity and HTN should be understood in a recursive rather than a unidirectional manner, as proposed recently in connection with cardiovascular diseases (Davidson, Alcántara & Miller, 2018; Zhang, Chen & Ma, 2018). Thus, negative affectivity is not only a risk factor for developing disorders such as HTN, it should also be recognized that negative affectivity can emerge after HTN diagnosis, thus worsening the condition via biological and/or behavioral mechanisms (see for example Jaén Águila et al., 2014; Moxotó & Malagris, 2015; Yu et al., 2015; and Özpelit et al., 2015).

It is important to mention the limitations of the present study. On the one hand, case-control type designs do not allow definitive conclusions to be drawn with respect to the causality or temporal relationship with the variables

involved (Yu et al., 2015). Transferring transverse designs to longitudinal designs will enable future research on the subject to make more rigorous assumptions about the causal relationships involved (Cole & Maxwell, 2003). A further limitation lies in the tools and methods applied to measure the variables. In the case of negative affectivity, self-reports were used, some of whose contents are of questionable validity (the case of STAI). In addition to this, recent meta-analyses have shown that the findings of studies using this type of tool to investigate the association with HTN are less consistent than those based on results structured diagnostic interviews (Yu et al., 2015). In the case of the HTN variable, only the presence or absence of this variable was considered (clinical measurement). Future studies should take into account complementary measures such as self-measured blood pressure or ambulatory monitoring (see for example Bajkó et al., 2012; Jaén Águila et al., 2014; and Uceda et al., 2013). While it is likely that most of the HTA sample taken in the present study had primary or essential hypertension, the presence of secondary hypertension (i.e., caused by another established medical condition) was not ruled out in these participants. Although the central objective of our work was not to investigate the causes of hypertension but rather the affective consequences of suffering from this pathology, it is also necessary to have a clear delimitation of the sample, which is why we agree with García-Vera, et al. (2010) that future studies should be able to clearly identify the type of hypertension suffered by the participants. Among the latter, for example, there is also masked or clinical HTN, which does not reflect a chronic pathology, but rather a momentary or circumstantial high blood pressure (Uceda et al., 2013). Another relevant fact not considered here is the time that has passed since the HTN was diagnosed. Finally, it is important to include other sociodemographic control measures that have shown association with indicators of negative affectivity in people with HTN, such as educational level and marital status (Soboka, et al. 2017).

Notwithstanding the above-mentioned limitations, the present paper is a first step towards collecting data on populations not included in previous studies and contributes to the body of literature on the specific symptomology of negative affectivity in individuals diagnosed with arterial hypertension. The findings not only have implications at the theoretical level, but also open the evidence-based way to psychological clinical treatment for those suffering from this chronic condition (Fu et al., 2015). Addressing comorbid affectivity factors is also of relevance in increasing adherence to medication in this type of patient (Amico et al., 2017; Dyussenova et al., 2018; Sanz et al., 2010; Yu et

al., 2015). In summary, the findings of the present paper underscore the importance of focusing on certain traits of negative affectivity in those already diagnosed with HTN, who show depressive-somatic symptoms (particularly in terms of irritability and loss of energy) and temperament anger (in particular the propensity to present or response with anger), since these symptoms could favor the persistence of high blood pressure over longer periods.

Funding

This work was financed by the National Fund for Innovation and Scientific and Technological Development (fondocyt) in the Dominican Republic. The funder had no role in the design of the study, data collection and analysis, decision to publish or preparation of the manuscript and/or adherence to medical treatment.

References

- Algina, J., Keselman, H. J., & Penfield, R. D. (2005). An alternative to Cohen's standardized mean difference effect size: a robust parameter and confidence interval in the two independent groups case. *Psychological Methods, 10*(3), 317–328. doi:10.1037/1082-989x.10.3.317
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed). Washington, DC: American Psychiatric Association.
- Amico, K. R., Mugavero, M., Krousel-Wood, M. A., Bosworth, H. B., & Merlin, J. S. (2017). Advantages to Using Social-Behavioral Models of Medication Adherence in Research and Practice. *Journal of General Internal Medicine, 33*(2), 207–215. doi:10.1007/s11606-017-4197-5
- Bajkó, Z., Szekeres, C.-C., Kovács, K. R., Csapó, K., Molnár, S., Soltész, P.,... Csiba, L. (2012). Anxiety, depression and autonomic nervous system dysfunction in hypertension. *Journal of the Neurological Sciences, 317*, 112–116. doi:10.1016/j.jns.2012.02.014
- Beck, A., Steer, R. & Brown, G. (1996). *Beck Depression Inventory*. San Antonio, E.U.: Psychological Corporation.
- Camacho, J., Echeverría, G., Barros, J., Maiz, A., & Rigotti, A. (2018). Depression and Stress are Highly Associated with Hypertension, Diabetes, and Cardiovascular Disease in Chilean Population. *Atherosclerosis Supplements, 32*, 74. doi:10.1016/j.atherosclerosis.2018.04.A
- Casiglia, E., & Tikhonoff, V. (2018). Essential hypertension: the specialist as part of therapeutic intervention. *Hypertension Research, 41*(5), 323–325. doi:10.1038/s41440-018-0031-7
- Cole, D. A., & Maxwell, S. E. (2003). Testing Mediational Models With Longitudinal Data: Questions and Tips in the Use of Structural Equation Modeling. *Journal of Abnormal Psychology, 112*(4), 558–577. doi:10.1037/0021-843x.112.4.558
- Davidson, K. W., Alcántara, C., & Miller, G. E. (2018). Selected psychological comorbidities in coronary heart disease: Challenges and grand opportunities. *American Psychologist, 73*(8), 1019–1030. doi:10.1037/amp0000239
- Dyussenova, L., Pivina, L., Semenova, Y., Bjørklund, G., Glushkova, N., Chirumbolo, S., & Belikhina, T. (2018). Associations between depression, anxiety and medication adherence among patients with arterial hypertension: Comparison between persons exposed and non-exposed to radiation from the Semipalatinsk Nuclear Test Site. *Journal of Environmental Radioactivity, 195*, 33–39. doi:10.1016/j.jenvrad.2018.09.016
- Fu, W., Ma, L., Zhao, X., Li, Y., Zhu, H., Yang, W.,... Liu, H. (2015). Antidepressant medication can improve hypertension in elderly patients with depression. *Journal of Clinical Neuroscience. doi:10.1016/j.jocn.2015.03.067*
- García-Batista, Z. E., Guerra-Peña, K., Cano-Vindel, A., Herrera-Martínez, S. X., & Medrano, L. A. (2018). Validity and reliability of the Beck Depression Inventory (BDI-II) in general and hospital population of Dominican Republic. *PLOS ONE, 13*(6), e0199750. doi:10.1371/journal.pone.0199750
- García-Batista, Z. E., Guerra-Peña, K., Cano-Vindel, A., Herrera-Martínez, S. X., Flores-Kanter, P. E. & Medrano, L. A. (2018). Evidencias de validez y fiabilidad de las Puntuaciones del STAXI-2 para población general y hospitalaria: Estudio con una muestra de adultos de República Dominicana. *Suma Psicológica, 25*(1), 21–29. doi:10.14349/sumapsi.2018.v25.n1.3
- García-Batista, Z. E., Guerra-Peña, K., Cano-Vindel, A., Herrera-Martínez, S. X., Flores-Kanter, P. E., & Medrano, L. A. (2017). Propiedades psicométricas del Inventario de ansiedad estado-rasgo en población general y hospitalaria de República Dominicana. *Ansiedad y Estrés, 23*(2-3), 53–58. doi:10.1016/j.anyes.2017.09.004
- García-Vera, M. P., Sanz, J., Espinosa, R., Fortún, M., & Magán, I. (2010). Differences in emotional personality traits and stress between sustained hypertension and normotension. *Hypertension Research, 33*(3), 203–208. doi:10.1038/hr.2009.210
- Guillen-Riquelme, A. & Buela-Casal, G. (2015). Estructura factorial del cuestionario de Ansiedad Estado-Rasgo (STAI) para pacientes diagnosticados con depresión. *Salud Mental, 38*(4), 293–298.
- Jaén Águila, F., Mediavilla García, J. D., Navarrete Navarrete, N., Ramos Cortés, J. L., Fernández Torres, C., & Jiménez Alonso, J. (2014). Ansiedad, depresión y su implicación en la hipertensión arterial resistente. *Hipertensión y Riesgo Vascular, 31*(1), 7–13. doi:10.1016/j.hipert.2013.08.001
- Kaplan, M. S. & Nunes, A. (2003). The psychosocial determinants of hypertension. *Nutr Metab Cardiovasc Dis, 13*, 52–59.
- Kohn, R., Ali, A. A., Puac-Polanco, V., Figueroa, C., López-Soto, V., Morgan, K., ... Vicente, B. (2018). Mental

- health in the Americas: an overview of the treatment gap. *Revista Panamericana de Salud Pública*, 42. doi:10.26633/rpsp.2018.165
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, 4. doi:10.3389/fpsyg.2013.00863
- Meyer, C. M., Armenian, H. K., Eaton, W. W. & Ford, D. E. (2004). Incident hypertension associated with depression in the Baltimore Epidemiologic Catchment area follow-up study. *Journal of Affective Disorders*, 83, 127-133. doi: 10.1016/j.jad.2004.06.004
- Moxotó, G. A. & Malagris, L. E. N. (2015). Raiva, stress emocional e hipertensão: Um estudo comparativo. *Psicologia: Teoria e Pesquisa*, 31(2), 221-227. doi: 10.1590/0102-37722015021189221227
- Mushtaq, M. & Najam, N. (2014). Anger as a psychological risk factor of hypertension. *Pakistan Journal of Psychological Research*, 29(1), 21-37.
- Norman, G. (2010). Likert scales, levels of measurement and the “laws” of statistics. *Advances in Health Sciences Education*, 15(5), 625–632. doi:10.1007/s10459-010-9222-y
- Organización Mundial de la Salud (2000). Comparación transnacional de la prevalencia de los trastornos mentales y los factores con ellos correlacionados. *Bulletin of the World Health Organization*, 78,41.
- Ozdemir, A. F., Wilcox, R. R., & Yildiztepe, E. (2012). Comparing Measures of Location: Some Small-Sample Results When Distributions Differ in Skewness and Kurtosis Under Heterogeneity of Variances. *Communications in Statistics-Simulation and Computation*, 42(2), 407–424. doi:10.1080/03610918.2011.636163
- Özpelit, M. E., Özpelit, E., Doğan, N. B., Pekel, N., Ozyurtlu, F., Yilmaz, A.,... Ercan, E. (2015). Impact of anxiety level on circadian rhythm of blood pressure in hypertensive patients. *International Journal of Clinical and Experimental Medicine*, 8(9),16252-16258.
- Plath, D. W., Mbwambo, J. K., Fonner, V. A., Horowitz, B., Zager, P., Schrader, R., ... Sweat, M. D. (2018). Prevalence of CKD, Diabetes, and Hypertension in Rural Tanzania. *Kidney International Reports*, 3(4), 905–915. doi:10.1016/j.ekir.2018.04.006
- R Core Team (2016). *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing.
- Rad, M. S., Martingano, A. J., & Ginges, J. (2018). Toward a psychology of Homo sapiens: Making psychological science more representative of the human population. *Proceedings of the National Academy of Sciences*, 115(45), 11401–11405. doi:10.1073/pnas.1721165115
- Rafanelli, C., Offidani, E., Gostoli, S. & Roncuzzi, R. (2012). Psychological correlates in patients with different levels of hypertension. *Psychiatry Research*, 198, 154-160. doi: 10.1016/j.psychres.2011.09.014
- Redina, O. E., & Markel, A. L. (2018). Stress, Genes, and Hypertension. Contribution of the ISIAH Rat Strain Study. *Current Hypertension Reports*, 20(8). doi:10.1007/s11906-018-0870-2
- Ruiz, J-F. M. (2005). Los factores definitorios de los grandes grupos de edad de la población: Tipos, subgrupos, umbrales. *Revista Electrónica de Geografía y Ciencias Sociales*, 9 (190).
- Rutledge, T., & Hogan, B. E. (2002). A Quantitative Review of Prospective Evidence Linking Psychological Factors With Hypertension Development. *Psychosomatic Medicine*, 64(5), 758–766. doi:10.1097/01.psy.0000031578.42041.1c
- Sahraian, A., Mokhtari, M., Moaref, A., Rezaee, V., Moghimi, E. & Mani, A. (2015). Hypertensive patients and normotensive individuals: Differences in anger inventory. *International Cardiovascular Research Journal*, 9(4), 216-219. doi: 10.17795/icrj-9(4)216
- Sanz, J. (2014). Recomendaciones para la utilización de la adaptación española del Inventario de Ansiedad de Beck (BAI) en la práctica clínica. *Clinica y Salud*, 25(1), 39–48. doi:10.5093/cl2014a3
- Sanz, J., García-Vera, M. P., Espinosa, R., Fortún, M., Magán, I., & Segura, J. (2010). Psychological Factors Associated with Poor Hypertension Control: Differences in Personality and Stress between Patients with Controlled and Uncontrolled Hypertension. *Psychological Reports*, 107(3), 923–938. doi:10.2466/09.15.20.pr0.107.6.923-938
- Sanz, J., García-Vera, M. P., Fortún, M. & Espinosa, R. (2005, julio). *Desarrollo y propiedades psicométricas de una versión breve española del Inventario para la Depresión de Beck-II (BDI-II)*. Comunicación presentada en el V Congreso Iberoamericano de Evaluación Psicológica, Buenos Aires (Argentina), 1-2 de julio.
- Siegel, J. M. (1986). The multidimensional anger inventory. *Journal of Personality and Social Psychology*, 51(1), 191-200.
- Soboka, M., Gudina, E. K., & Tesfaye, M. (2017). Psychological morbidity and substance use among patients with hypertension: a hospital-based cross-sectional survey from South West Ethiopia. *International Journal of Mental Health Systems*, 11(1). doi:10.1186/s13033-016-0108-0
- Sorsdahl, K., Sewpaul, R., Evans, M., Naidoo, P., Myers, B., & Stein, D. J. (2016). The association between psychological distress, alcohol use and physical non-communicable diseases in a nationally representative sample of South Africans. *Journal of Health Psychology*, 23(4), 618–628. doi:10.1177/1359105316642832
- Spielberger, C. D. (1991). *State-Trait Anger Expression Inventory manual*. Odessa, FL: Psychological Assessment Resources.
- Suls, J. (2017). Toxic Affect: Are Anger, Anxiety, and Depression Independent Risk Factors for Cardiovascular Disease? *Emotion Review*, 10(1), 6–17. doi:10.1177/1754073917692863

- Suls, J., & Bunde, J. (2005). Anger, Anxiety, and Depression as Risk Factors for Cardiovascular Disease: The Problems and Implications of Overlapping Affective Dispositions. *Psychological Bulletin*, *131*(2), 260–300. doi:10.1037/0033-2909.131.2.260
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics*. New York, EEUU: Pearson Education.
- Tel, H. (2013). Anger and depression among the elderly people with hypertension. *Neurology, Psychiatry and Brain Research*, *19*(3), 109–113. doi:10.1016/j.npbr.2013.05.003
- Tikhonoff, V., Hardy, R., Deanfield, J., Friberg, P., Kuh, D., Muniz, G., ... Richards, M. (2014). Symptoms of anxiety and depression across adulthood and blood pressure in late middle age. *Journal of Hypertension*, *32*(8), 1590–1599. doi:10.1097/hjh.0000000000000244
- Tully, P. J., Peters, R., Pérès, K., Anstey, K. J., & Tzourio, C. (2018). Effect of SSRI and calcium channel blockers on depression symptoms and cognitive function in elderly persons treated for hypertension: three city cohort study. *International Psychogeriatrics*, *30*(9), 1345–1354. doi:10.1017/s1041610217002903
- Uceda, M. I., Sanz Fernández, J., Espinosa López, R. & García-Vera, M. P. (2013). Perfil emocional y cognitivo de la hipertensión arterial esencial mantenida frente a la normotensión. *Clínica y Salud*, *24*, 67-76. doi: 10.5093/cl2013a8
- Vos, T., Abajobir, A. A., Abate, K. H., Abbafati, C., Abbas, K. M., Abd-Allah, F., ... Abera, S. F. (2017). Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*, *390*(10100), 1211–1259. doi:10.1016/s0140-6736(17)32154-2
- Wang, H., Naghavi, M., Allen, C., Barber, R. M., Bhutta, Z. A., Carter, A., ... Coates, M. M. (2016). Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015. *The Lancet*, *388*(10053), 1459–1544. doi:10.1016/s0140-6736(16)31012-1
- Wilcox, R. (2012). *Introduction to Robust Estimation and Hypothesis Testing*. New York, EEUU: Academic Press.
- Wilcox, R. R., & Keselman, H. J. (2003). Modern Robust Data Analysis Methods: Measures of Central Tendency. *Psychological Methods*, *8*(3), 254–274. doi:10.1037/1082-989x.8.3.254
- Woodward, M. (2014). *Epidemiology. Study Design and Data Analysis*. New York, E.U.: CRC Press.
- World Health Organization. (2013). *A Global Brief on Hypertension*. Suiza: WHO Press.
- Wu, J.-R., Cummings, D. M., Li, Q., Hinderliter, A., Bosworth, H. B., Tillman, J., & DeWalt, D. (2018). The effect of a practice-based multicomponent intervention that includes health coaching on medication adherence and blood pressure control in rural primary care. *The Journal of Clinical Hypertension*, *20*(4), 757–764. doi:10.1111/jch.13265
- Yan, L. L., Liu, K., Matthews, K. A., Daviglius, M. L., Ferguson, T. F., & Kiefe, C. I. (2004). Psychosocial factors and risk of hypertension. The coronary artery risk development in young adults (CARDIA) study. *ACC Current Journal Review*, *13*(2), 20–21. doi:10.1016/j.accreview.2003.12.025
- Yu, P., Wenpeng, C., Qi, C., Dong, W., Ting, A. & Jin Y. (2015). Association between anxiety and hypertension: a systematic review and meta-analysis of epidemiological studies. *Neuropsychiatric Disease and Treatment*, *11*, 1121-1130. doi: 10.2147/NDT.S77710
- Zhang, Y., Chen, Y., & Ma, L. (2018). Depression and cardiovascular disease in elderly: Current understanding. *Journal of Clinical Neuroscience*, *47*, 1–5. doi:10.1016/j.jocn.2017.09.022