# Association of arterial hypertension and depression in primary care patients

**Asociación de hipertensión arterial y depresión en pacientes de atención primaria**

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## Abstract

Introduction: In primary care, approximately 10% of hypertensive patients suffer from depression and another 10% have depressive symptoms.
Purpose: To determine the association between hypertension awareness and depressive symptoms in primary care.
Methods: A cross-sectional study was conducted in a primary care population that included 2676 at-risk individuals in 78 primary care practices.
Results: Depression was reported by 14.1% (116/822) of the conscious hypertensives, by 8.7% (38/439) of the subjects who were unaware of their hypertension and by 9.3% (129/1,382) of the normotensives.
Conclusions: Depressive symptoms are common in hypertensive persons, even without comorbidities, if the person is already aware of his or her hypertension.

**Keywords**: arterial hypertension,depression,primary care, obesity. source: DeCS
**DOI Number: 10.14704/nq.2022.20.13.NQ88018 NeuroQuantology 2022; 20(13): 125-132**

**Resumen**

Introducción:En la atención primaria, aproximadamente el 10% de los pacientes hipertensos sufren de depresión y otro 10% tiene síntomas depresivos.
Objetivo: Determinar la asociación de la conciencia de la hipertensión y los síntomas depresivos en atención primaria.
Método: Se realizó un estudio transversal en población de atención primaria que incluyó 2676 personas de riesgo en 78 prácticas de atención primaria.
Resultados:La depresión fue referida por el 14,1% (116/822) de los hipertensos conscientes, por el 8,7% (38/439) de los sujetos que no sabían de su hipertensión y por el 9,3% (129/1.382) de los normotensos.
Conclusiones: Los síntomas depresivos son comunes en personas hipertensas aún sin comorbilidades, si la persona ya es consciente de su hipertensión.

**Palabras Clave**: hipertensión arterial,depresión,atención primaria , obesidad fuente : DeCS

**Introduction**

Hypertension affects one in three adults worldwide and is the most critical risk factor for disability-adjusted life years. In the primary care setting, approximately 10% of patients suffer from depression and another 10% have depressive symptoms[(1)]. Based on an extensive Swedish population registry, Sandström et al. showed that persons with a diagnosis of hypertension are also more commonly diagnosed with depression than persons without hypertension[(2)]. Furthermore, the coexistence of self-reported hypertension and depressive symptoms was associated with a 15 % higher relative risk of all-cause mortality than hypertension without depressive symptoms, even after adjustment for lifestyle factors and comorbid conditions; as reported in the U.S. National Health and Nutrition Epidemiologic and Epidemiologic Follow-up Study (NHANES)[(3)]. Thus, when present simultaneously, hypertension and depressive symptoms form a toxic combination highlighting the importance of recognizing of depressive symptoms in hypertensive subjects.

However, comorbidities such as cardiovascular disease (CVD), diabetes, and obesity may have confounding effects on the association between hypertension and mental distress. It has also been suggested that having a diagnosis of hypertension may partly explain the higher level of psychological distress in patients treated for hypertension[(4)]. This awareness of hypertension may have a labeling effect that causes mental distress, as suggested by Hamer et al.[(5)], or it may be the result of increased health care utilization of depressed persons, as proposed by Michal et al.[(6)] They also reported that unawareness of hypertension was inversely associated with depression. In these studies, a substantial proportion of patients had CVD or diabetes, and blood pressure was measured on only one occasion. It was possible to investigatethe association between hypertension knowledge and depressive symptoms in subjects who did not have overt CVD, renal disease, or diabetes. The diagnosis of previously unknown hypertension was confirmed with home blood pressure measurements and, therefore, the study excluded subjects with white coat hypertension. We presume that having a diagnosis of hypertension, rather than elevated blood pressure *per se*, is associated with depressive symptoms. The secondary aim was to investigate factors predisposing subjects with known hypertension to depressive symptoms.

**Method**

A cross-sectional study was conducted in primary care population including 2676 middle-aged at-risk individuals without established cardiovascular or renal disease or type 2 diabetes from August 2020 to September 2021 in 78 primary health care practices. The participation rate was 74% (4450/6013). Those with at least one cardiovascular risk factor ( *n*= 3072) were invited to an enrollment screening performed by a trained study nurse. Risk factors taken into account were last blood pressure ≥140/90 mmHg, use of antihypertensive medication, history of diabetes or gestational hypertension, family history of premature CVD, waist circumference at umbilicus level ≥80 cm in women and ≥ 94 cm in men . Subjects with known cardiovascular disease, renal disease, or diabetes were excluded. This study was approved by the Universidad Regional Autónoma de Los Andes (UNIANDES).

Blood pressure (BP) was measured by a trained nurse with a mercury sphygmomanometer with subjects in a sitting position after resting for at least 5 minutes with the cuff placed on the arm. If the mean of two systolic BP readings was ≥140 mmHg or diastolic BP ≥90 mmHg and subjects had no antihypertensive medication, they were taught to use a validated automatic BP monitor loaned to them for home BP monitoring. Participants whose arm circumference was ≥32 cm

wore a larger cuff. Subjects were advised to perform duplicate BP measurements in a sitting position after five minutes of rest in the morning and evening for one week. The measurements recorded except for those on the first day were used to calculate mean home BP. Subjects were classified according to their hypertension status into three categories:

1. conscious hypertensives (subjects on antihypertensive medication)
2. unconscious hypertensives (no antihypertensive medication, mean home BP monitoring ≥135 mmHg for systolic or ≥85 mmHg for diastolic).
3. normotensive

Height and weight were measured with subjects standing without shoes or outer garments, and waist circumference at the level midway between the lower rib margin and the iliac crest. Body mass index (BMI) was calculated as weight (kg) divided by the square of height ($m^2$ ). BMI classification was as follows: normal weight BMI <25.0 $kg/m^2$ , overweight BMI 25.0-29.9 $kg/m^2$ , obese BMI 30.0-34.9 $kg/m^2$ , severely obese BMI ≥35.0 $kg/m^2$ .

Study subjects completed self-administered questionnaires at the clinic prior to enrollment screening: senior high school (completed/not), cohabitation (yes/no), current smoking (yes/no), alcohol use (Alcohol Use Disorder Identification Test, AUDIT[7] , leisure-time physical activity level (NAFT), and Beck Depression Inventory (BDI)[8] . AUDIT score ≥8 was considered as the cutoff point for harmful alcohol use. NAFT was classified as follows: high: NAFT for at least 30 minutes at a time for six or more times per week; moderate: NAFT for at least 30 minutes at a time four to five times per week; low: NAFT for at least 30 minutes at a time for a maximum of three times per week. The presence of clinically significant depressive symptoms was defined as an IDB score ≥13, indicating at least mild depression.

The database and statistical processing of the data were performed and analyzed in the SPSS 26 statistical program (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used for the collection, presentation and interpretation of the results. Descriptive statistics are shown as the number of subjects and proportions for categorical variables. For normally distributed variables, means with standard deviations ( SD) are presented, and median with interquartile range (IQR) otherwise. Characteristics of normotensive, unconscious hypertensive, and conscious hypertensive subjects were compared with one-way analysis of variance, the Kruskal-Wallis test, or the chi-square test. Predictors of depressive symptoms (IDB ≥13) were modeled with logistic regression with the following independent variables: hypertension status, age, sex, education, cohabitation, smoking, alcohol consumption, NAFT, BMI according to category.

**Results**

We evaluated 2 676 persons at cardiovascular risk with a mean age of 58 ( SD7) years (55.7% women), who had no previously known CVD, diabetes, or renal disease. The characteristics and health behaviors of the subjects are presented in Table 1.Hypertension was diagnosed in 1,282 (47.9%) of the subjects, of whom 442 (34.5%) had not previously been diagnosed with hypertension and therefore were unaware of the disease. The normotensive subjects were slightly younger, more often female, more educated, and at lower risk of alcohol consumption than the hypertensive subjects. The prevalence of obesity (BMI ≥30.0 $kg/m^2$ ) was 49.9% (419/840) among conscious hypertensives, 29.9% (132/442) among non-conscious hypertensives, and 21.5% (300/1394) among normotensives (p < 0.001). Mean BMI was 29.5 $kg/m^2$ in women and 28.8 $kg/m^2$ in men.

Table 1. Characteristics of subjects according to hypertension status.

| | Normotensive n = 1394 | Unconscioushypertensivepatients n = 442 | Consciushypertensive n = 840 | p-value |
|---|---|---|---|---|
| Age, mean, years( SD ) | 57 (7) | 59 (7) | 60 (7) | <0.001 |

| | | | | |
|---|---|---|---|---|
| Women, n (%) | 814 (58,4) | 218 (49,3) | 458 (54,5) | 0.003 |
| Uppersecondary, n (%) | 239 (17,8) | 54 (12,7) | 91 (11,3) | <0.001 |
| Cohabitant, n (%) | 1030 (76,6) | 352 (82,6) | 630 (77,7) | 0.031 |
| Depressivesymptoms (IDB ≥13), n (%). | 129 (9.3) | 38 (8,7) | 116 (14,1) | <0.001 |
| IDB score, median (ITC) | 4,0 (2,0-8,0) | 4,0 (2,0-7,0) | 5,0 (3,0-9,0) | <0.001 |
| Current smoking, n (%) | 258 (18,5) | 80 (18,1) | 131 (15,6) | 0.202 |
| AUDIT score ≥8, n (%) | 251 (18,7) | 111 (25,8) | 162 (20,1) | 0.006 |
| NAFT, n (%)<br>Under<br>Moderate<br>High | <br>445 (34,0)<br>683 (51,1)<br>199 (14,9) | <br>162 (37,9)<br>207 (48,4)<br>59 (13,8) | <br>312 (38,9)<br>383 (47,7)<br>108 (13,4) | 0.219 |
| Systolic blood pressure, mmHg, mean ( SD ) | 134 (17) | 157 (16) | 146 (17) | <0.001 |
| Diastolic blood pressure, mmHg, mean ( SD ) | 81 (9) | 91 (9) | 86 (10) | <0.001 |
| Total cholesterol, mmol/l, mean ( SD ) | 5.4 (1.0) | 5,4 (0,9) | 5.1 (1.0) | <0.001 |
| Fasting glucose, mmol/l, mean *( SD)* | 5.5 (1.1) | 5.6 (1.0) | 5.8 (1.3) | <0.001 |
| Body mass index, kg/m 2 , mean ( SD ) | 28,2 (4,7) | 28,5 (4,6) | 30,7 (5,4) | <0.001 |
| Body mass index category, n (%)<br><25 kg/m $^2$<br>25.0-29.9 kg/m $^2$<br>30.0-34.9 kg/m $^2$<br>≥35.0 kg/m $^2$ | <br>207 (20,7)<br>491 (49,2)<br>228 (22,8)<br>72 (7.2) | <br>81 (19,5)<br>203 (48,8)<br>101 (24,3)<br>31 (7,5) | <br>87 (10,6)<br>311 (38,1)<br>277 (33,9)<br>142 (17,4) | <0.001 |
| Current medication, *n* (%)<br>Antidepressant<br>Beta blocker<br>calcium antagonist<br>ACE inhibitor or ARP antagonist<br>Diuretic<br>Statin | <br>28 (2,0)<br>0<br>0<br>3 (0,2)<br>2 (0,1)<br>61 (4,4) | <br>17 (3,8)<br>0<br>0<br>0<br>0<br>25 (5,7) | <br>45 (5,4)<br>433 (51,5)<br>233 (26,5)<br>473 (56,3)<br>231 (27,5)<br>184 (21,9) | <br><0.001<br><0.001<br><0.001<br><0.001<br><0.001<br><0.001 |



Source: statistical analysis , IDB: Beck Depression Inventory; AUDIT: Alcohol Use Disorders Identification Test; NAFT: leisure-time physical activity; ACE: angiotensin-converting enzyme; ARP: angiotensin receptor, p≤ 0.05 .

Depressive symptoms were reported by 14.1% (116/822) of conscious hypertensives, by 8.7% (38/439) of subjects unaware of their hypertension, and by 9.3% (129/1,382) of normotensives. In logistic regression analysis, the difference in depressive symptoms between hypertension status categories remained significant ( *p*= 0.0030) despite common risk factors. Compared with conscious hypertensives, both normotensives (OR (Odds Ratio) 0.62, 95% CI 0.45-0.86) ( *p*= 0.0038) and unconscious hypertensives (OR 0.54, 95% CI 0.35-0.84) ( *p* = 0.0067) had a lower risk for depressive symptoms.

The strongest predictor was female sex (OR 3.61, 95 % CI 2.06-6.32), followed by harmful alcohol consumption (OR 2.55, 95 % CI 1.40-4.64) and obesity (OR 2.50, 95 % CI 1.01-6.21). Non-smoking (OR 0.57, 95 % CI 0.33-0.99) and moderate compared to low NAFT (OR 0.53, 95 % CI 0.33-0.84) appeared to buffer depressive symptoms. These factors were independently associated with depressive symptoms also among the entire study population.

**Discussion**

In this study, we found that clinically significant depressive symptoms were significantly and independently associated with elevated blood pressure, if the subject was already aware of his or her hypertension. Second, in our sample clinically significant depressive symptoms

were associated with female sex, harmful alcohol consumption, and obesity. Non-smoking and moderate NAFT appeared to buffer against depressive symptoms.

The main strengths of our study are a representative sample of persons typically treated in primary care, the exclusion of subjects with known cardiovascular or renal disease and diabetes which decreases confounding by comorbidities, and the use of home blood pressure measurements excluding confounding by white coat hypertension. Our results suggest that the association of hypertension and depressive symptoms may be modified by several factors independently associated with depressive symptoms. These have not always been taken into account in medical studies, which probably contributes to the mixed results of previous investigations. The present study also has limitations. Because of the cross-sectional study design, we cannot determine any causality between hypertension and depressive symptoms. Although we were able to account for many factors that influence both depressive symptoms and hypertension, it is possible that factors such as other causes of mental distress and the number of visits to medical care confound the association found. Our study population only included subjects considered at risk for cardiovascular disease, which should be taken into account when applying our results to the general population. Given that only subjects with elevated blood pressure were instructed to perform home blood pressure measurements, we cannot exclude the possibility of masked hypertension.

Consistent with our findings, Hamer et al. observed an elevated risk of psychological distress in patients treated for hypertension, but not in unconscious hypertensives, compared with normotensive subjects in a large population-based study in England and Scotland[5] . Also Michal et al.[6] found that treated controlled but uncontrolled hypertension was associated with an increased risk of depression in a German population-based cohort study. Unawareness of hypertension has also been found to have a buffering effect against depressive symptoms. The researchers suggested that these findings are mainly explained by a higher health care utilization of depressed persons rather than a labeling effect[9,10] . The reason for these somewhat mixed results may be misclassification of subjects' hypertension status and confounding by comorbidity. In the aforementioned studies, hypertension status was determined by a single measurement and, therefore, possible misclassification of subjects with white coat hypertension to unconscious hypertensives may influence the results. We cannot rule out the possibility that depressed persons use more health care services, which increases the possibility of diagnostic recognition of hypertension[11,12] .

In our sample, the overall prevalence of depressive symptoms among conscious and unconscious hypertensive subjects was 22.8%. In a meta-analysis of 10 194 hypertensive subjects in 27 studies using self-assessment scales, Li et al.[13] found an even higher prevalence of depression (29.8%). One study had used IDB and, with a cutoff point of 16, the prevalence of depression was 26.3% in a sample of hypertensive patients. According to Li et al. self-assessment scales as measures can introduce considerable heterogeneity in the results[13,14] . The difference in the prevalence of depression between our study and the meta-analysis is probably due to the different methods used.

Most hypertensive patients who present to a primary care physician's office have been previously diagnosed and have already been prescribed an antihypertensive medication. Considering the deleterious effects of concomitant hypertension and depression, it is important to recognize depressive symptoms in hypertensive subjects. Our results suggest that female sex, harmful alcohol consumption, obesity, smoking, and low NAFT are factors that predispose hypertensive patients to depression. Depression and depressive symptoms affect a person's motivation and

ability to lead a healthy life. On the other hand, physical activity and other components of a healthy lifestyle promote psychological well-being. Not surprisingly, an unhealthy lifestyle that includes little physical activity and alcohol consumption has been associated with depression[15] , which is plausible in a bidirectional manner. Alcohol use disorder and depressive disorder have been found to double the risk of the other disorder[16,17] . In addition, obesity is related to an unhealthy lifestyle. A meta-analysis[18] provides evidence that depression and obesity are bidirectionally associated: there is a 37% increased risk of being obese in depressed adults, and obese adults have an 18% increased risk of being depressed. It should be noted that these lifestyle-related factors associated with depressive symptoms are also risk factors for hypertension. Therefore, contributing to these modifiable risk factors may attenuate the effect of the toxic combination of depressive symptoms and hypertension[19,20] .

**Conclusions**

Depressive symptoms are common in hypertensive persons even without comorbidities, if the person is already aware of his or her hypertension. Therefore, discussing a new chronic condition and lifelong medication should occur in a sensitive and supportive manner. Many modifiable lifestyle factors can contribute to the association of hypertension and depressive symptoms. Clinicians should consider depressive symptoms when treating hypertensive subjects and find ways to improve their psychological well-being to promote a favorable lifestyle and hypertension control. Future research is expected to clarify whether treatment of screen-detected depression would also reduce blood pressure levels in hypertensive subjects.

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