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Effect of Situational Anxiety and Depression on 24-Hour Ambulatory Blood Pressure Monitorization in Patients with Hypertension

Durumsal Anksiyete ve Depresyonun Hipertansif Hastalarda 24-Saatlik Ambulatuar Kan Basıncı Monitorizasyonu Üzerine Etkisi

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ABSTRACT Objective: To evaluate the effects of situational anxiety, stress and depression on 24-hour ambulatory blood pressure monitorization (ABPM) in patients with hypertension. **Material and Methods:** Three hundred twenty-six medically treated hypertensive patients were included in the study. According to their 24-hour ABPM results 162 patients were categorized as dipper hypertensives, 164 patients were categorized as non-dipper hypertensives. All patients completed self-report questionnaires which include General Health Questionnaire (GHQ-12), State-trait anxiety inventory (STAI) form TX-I and STAI form TX-II before ABPM. STAI FORM TX-I questionnaire was repeated after ABPM. **Results:** GHQ and STAI FORM TX-I score of the non-dipper group were statistically significantly higher than the dipper group. Following ABPM, there was a statistically significant decrease in STAI FORM TX-I score in non-dipper group. A positive correlation was found between age and STAI FORM TX-I score (r=0.531, p=0.0001). There were significant differences in GHQ-12 and STAI FORM TX-I scores among groups according to education level (F=6.175, p=0.003 and F=5.877, p=0.003, respectively). Post hoc analysis revealed that the significance was due to the differences between group 3 (university level) and group 1 and 2 (elementary school and high school level). STAI FORM TX-I scores of the patients differed significantly in terms of their socioeconomic status (F=5.9701, p=0.003). Patients with higher socioeconomic status had lower STAI FORM TX-I scores compared to the middle and poor socioeconomic status. **Conclusion:** Situational anxiety, especially in elderly, poor and lower-educated patients might be a factor for non-dipping phenomenon.

Keywords: Essential hypertension; anxiety; blood pressure monitoring, ambulatory

ÖZET Amaç: Mevcut veriler hipertansiyon ile depresyon, anksiyete arasında ilişki olduğunu göstermektedir. Çalışmamızda durumsal anksiyete ve depresyonun 24-saatlik ambulatuar kan basıncı monitorizasyonu üzerine (AKBM) etkilerini araştırmak istedik. **Gereç ve Yöntemler:** Çalışmaya hipertansiyon tanısı ile izlenen 326 hasta alındı. Tüm hastalara 24-saatlik AKBM yapıldı. Sonuçlara göre 164 hasta non-dipper hipertansif, 162 hasta ise dipper hipertansif olarak gruplandırıldı. Tüm hastalara Genel Sağlık Anketi (GSA-12), Durumluluk-Süreklilik Kaygı Ölçeği (DSKÖ) form TX-1 ve TX-2 uygulandı. DSKÖ form TX-I AKBM sonrası tekarlandı. **Bulgular:** İki grup arasında DSKÖ form TX-2 puanları arasında fark gözlenmedi. GSA-12 ve DSKÖ form TX-1 puanları non-dipper grupta anlamlı olarak yüksek bulundu. AKBM sonrası non-dipper grupta DSKÖ form TX-1 puanında anlamlı düşüş gözlenirken, bu düşüş dipper grupta istatistiksel anlamlılığa ulaşmadı. DSKÖ form TX-1 puanı ile yaş arasında pozitif ilişki saptandı (r=0,531, p=0,0001). Eğitim seviyesine göre GSA-12 ve DSKÖ form TX-1 puanı arasında farklılıklar bulundu (sırası ile, F=6,175, p=0,003 and F=5,877, p=0,003). Post-hoc analizde bu farklılığın grup 3 (üniversite) ile grup 1 ve 2 (lise-ilkokul) arasında olduğu gözlendi. DSKÖ form TX-1 puanları ile hastaların sosyoekonomik seviyelerine göre farklılıklar saptandı (F=5,9701, p=0,003). Yüksek sosyoekonomik seviyesine sahip olan hastaların DSKÖ form TX-1 puanları orta ve düşük sosyoekonomik seviyede olan hastalar göre düşüktü. **Sonuç:** Durumsal anksiyete, özellikle yaşlı, gelir düzeyi ve eğitim seviyesi düşük hastalarda non-dipping fenomeni için bir faktör olabilir. Çalışmamız depresyonda olan hastalarda gece kan basıncı düşüşünün azalabileceğini düşündürmektedir.

Anahtar Kelimeler: Esansiyel hipertansiyon; anksiyete; kan basıncı izlemi, ambulatuar

Hypertension (HT) is strong, consistent and etiologically relevant risk factor for cardiovascular disease as well as kidney disease, stroke, and congestive heart failure.[1,2] Normally, there is a physiological decrease in blood pressure (BP) during sleep relative to the wakefulness which is called as dipping pattern. In some individuals, whether they are normo or hypertensive, this nocturnal decrease does not occur and this is called as non-dipping pattern.[1-3] Non-dipping BP status is associated with increased risk for cardiovascular disease.[1-4] The pathophysiological mechanisms responsible for this non-dipping pattern are not fully understood. Autonomic nervous system abnormalities, dietary factors, smoking, sedentary lifestyle, anxiety disorders all have been suggested as potential etiological factors of this impaired BP circadian rhythm.[5,6]

Ambulatory blood pressure monitoring is a non-invasive tool that is used in the diagnosis and management of hypertension.[7] Although it is the best way of diagnosing hypertension, it might induce discomfort and state of anxiety in some patients.[8] In this study, starting with the possibility of ambulatory blood pressure monitorization (ABPM) induced stress and anxiety in hypertensive patients, we intend to compare anxiety level in dipper and non-dipper hypertensive patients.

MATERIAL AND METHODS

A total of 326 medically treated hypertensive patients were enrolled in the study. According to the ABPM results, 162 patients were categorized as dipper hypertensives and the remaining were categorized as non-dipper hypertensives. Sakarya University Ethics Committee approved the study and each subject were informed consent before enrollment. Patients with ischemic heart disease, valvular disease, chronic kidney disease, thyroid dysfunction, liver disease, malignancy, diabetes mellitus, hyperlipidemia, obstructive sleep apnea and sleep disturbances were excluded from the study. Clinical and demographic characteristics of the patients were obtained by face-to-face interview. According to guidelines, hypertension was defined as systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg and the patients already using of antihypertensive medication.[1,2] All patients underwent 24-hour ABPM using non-dominant arm (Physio Quant; Envitec, Germany). The device recorded BP values every 15 min. during day (07:00-23:00 h) and every 20 min. during night (23:00-07:00 h). Venous blood samples were collected in early morning and analyzed for complete blood count and biochemistry parameters (COBAS c311, Roche Diagnostics, Germany).

All patients completed self-report questionnaires which include General Health Questionnaire (GHQ-12), State-trait anxiety inventory (STAI) form TX-I and STAI form TX-II before ABPM. STAI FORM TX-I questionnaire was repeated after ABPM.

State-trait anxiety inventory (STAI): Developed by Spielberg, was used to assess the degree of anxiety in study patients.[9] The scale's validity and reliability for Turkish population was conducted by Öner et al. It composed of two subscales, each containing 20 questions.[10] STAI FORM TX-I which indicate the anxiety level at a specific situation and STAI FORM TX-II which describe how individuals generally feel. Scores of the two subscales range between 20 to 80. Lower and higher scores suggest lower and higher anxiety levels, respectively.

The General Health Questionnaire (GHQ): developed to detect subjects with physiopathology troubles.[11] It was originally developed as 60-item instrument, but currently shortened versions of the questionnaire are available. The GHQ used in this study includes 12 items. Scores range from 0 to 36, with higher scores indicating physiological distress. Its Turkish reliability and validity was evaluated by Kılıç.[12] The proposed cut-off point of the GHQ- 12 was ½, with a specificity of 0.84 and sensitivity of 0.74.

ISTATISTICAL ANALYSIS

Continuous variables were expressed as mean±SD. Categorical variables were expressed as percentages. Statistical analyses were performed by using SPSS program package (version 20 software, SPSS Inc. Chicago, Illinois, USA). According to Kolmogorov-Smirnov test all data had normal distri-

bution. The following tests were used for statistical analysis: (1) ANOVA test was used to compare and analyze the group differences, (2) Bonferroni test was applied for post hoc analysis for multiple comparisons of groups, (3) independent sample t-test was used for two group comparisons, (4) paired t-test was used to compare the means of the related data, and (5) Pearson correlation was used to assess the relation between variables. A p value <0.05 was considered significant.

RESULTS

Based on the ABPM data, 162 patients were classified as dipper hypertensive, 164 patients were classified as non-dipper hypertensive. There were no statistically significant differences between two groups with respect to age, gender, height, weight, BMI, smoking status, alcohol consumption, educational level, marital status, family type and socioeconomic status. The clinical and demographic data of the study population is shown in Table 1. Patients were treated with β-blocker, calcium channel blocker, angiotensin-converting enzyme inhibitor, angiotensin receptor blocker and alpha blocker. There were no differences in day systolic BP, day diastolic BP, antihypertensive treatment and biochemical parameters between two groups. As expected, night systolic BP and night diastolic BP values were significantly higher in non-dipper group compared to that of dipper group (Table 2).

Table 3 shows the average GHQ, STAI FORM TX-I and STAI FORM TX-II scores of the patients. There was no statistically significant difference in STAI FORM TX-II score between two groups. GHQ and STAI FORM TX-I score of the non-dipper group were statistically significantly higher than the dipper group. Following ABPM, there was a statistically significant decrease in STAI FORM TX-I score in non-dipper group. Although, the scores on STAI FORM TX-I decreased in dipper group, this decrease did not reach statistical significance (Table 4).

A positive correlation was found between age and STAI FORM TX-I score (r=0.531, p=0.0001). There were significant differences in GHQ-12 and STAI FORM TX-I scores among groups according to education level (F=6.175, p=0.003 and F=5.877, p=0.003, respectively). Post hoc analysis revealed that the significance was due to the differences between group 3 (university level) and group 1 and 2 (elementary school and high school level). STAI FORM TX-I scores of the patients differed significantly in terms of their socioeconomic status (F=5.9701, p=0.003). Patients with higher socioeconomic status had lower STAI FORM TX-I scores compared to the middle and poor socioeconomic status.

DISCUSSION

In our study it has been shown that HT patients with non-dipper BP profile were anxious and depressed. In our study, the mean STAI FORM TX-I scores of the non-dipper patients, immediately before the ambulatory device wearing, were higher compared to that of the dipper patients. Although the mean STAI FORM TX-I scores of the both groups were decreased after device removal, the difference reached statistical significance only in non-dipper patients.

Hypertension is a chronic disease and in long term it is a major risk factor for premature cardiovascular morbidity and mortality.[1,2] Cardiovascular diseases are still the leading cause of death and the optimal control of the risk factors is the key for the patient outcome and rehospitalization. Treatment of hypertension is of paramount importance and needs to be observed closely. 24-hour blood pressure monitoring is an important tool for the diagnosis and the treatment of hypertension.

BP fluctuates throughout 24 hours, it is normally higher during the daytime and lower at night. Nocturnal dipping pattern includes a decrease during sleep of both systolic and diastolic BP about 10% from daytime levels, and its absence is assumed to be an independent cardiovascular risk factor in hypertensive patients.[13-15] Autonomic nervous system is an important modulator of this circadian rhythm. It has been demonstrated that non-dipper hypertensive patients has increased level of sympathetic activity.[16] Data suggest that al-

TABLE 1: Clinical and demographic characteristics of the patients.

	Non-dipper group (n=164)	Dipper group (n=162)	P
Sex			0.288
Female n,(%)	83 (50.6)	87(53.7)	
Male n,(%)	81 (49.4)	75 (46.3)	
Age (year)	49.9±10.8	50.8±12.0	0.512
Height (m)	1.6±0.09	1.6±0.09	0.725
Weight (kg)	76.5±12.1	77.7±12.4	0.362
BMI	26.9±3.3	27.2±3.6	0.496
Smoking n,(%)	41(25)	42(25.9)	0.474
Alcohol n,(%)	19(11.58)	22(13.58)	0.354
Educational level			0.867
Elementary n,(%)	90 (54.87)	92 (56.79)	
High school n,(%)	52 (31.70)	47 (29.01)	
University n,(%)	22 (13.41)	23 (14.19)	
Family type			0.507
Nuclear n,(%)	115 (70.12)	122 (75.30)	
Joint n,(%)	37 (22.56)	32 (19.75)	
Broken n,(%)	12 (7.31)	8 (4.93)	
Socioeconomic status			0.794
Poor n,(%)	25 (15.24)	29 (17.90)	
Middle n,(%)	105 (64.02)	99 (61.11)	
High n,(%)	34 (20.73)	34 (20.98)	

BMI: Body mass index.

TABLE 2: Biochemical parameters and the antihypertensive treatment of the two groups.

	Non-dipper group (n=164)	Dipper group (n=162)	P
Glucose (mg/dl)	99.0±10.9	97.1±9.6	0.086
TC (mg/dl)	187.9±32.4	189.1±30.5	0.740
LDL (mg/dl)	121.3±29.3	123.6±32.4	0.503
HDL (mg/dl)	44.0±10.4	42.6±9.8	0.227
TG (mg/dl)	148.4±71.2	145.4±71.5	0.706
SBP (DAY)	132.9±11.9	131.6±12.7	0.163
DBP (DAY)	81.9±9.2	82.4±8.4	0.614
SBP (NIGHT)	127.1±11.5	112.7±26.8	0.000
DBP (NIGHT)	79.1±6.3	68.2±8.8	0.000
NMUP			0.870
One, n (%)	23 (14.02)	26 (16.04)	
Two, n (%)	118 (71.95)	113 (69.75)	
More than two, n(%)	23 (14.02)	23 (14.19)	
ACE-I/ARB n (%)	81 (49.39)	76 (46.91)	0.368
B-BLOCKER n (%)	57 (34.75)	54 (33.33)	0.439
CCB n (%)	61 (37.19)	64 (39.50)	0.376
AB n (%)	36 (21.95)	30 (18.51)	0.263

AB: alpha blocker; ARB: angiotensin receptor blocker; ACE-I: angiotensin converting enzyme inhibitor; CCB: calcium channel blocker; DBP: diastolic blood pressure; HDL: high density lipoprotein; LDL: low density lipoprotein; NMUP: number of medications used by the patients; SBP: systolic blood pressure; TC: total cholesterol; TG: triglyceride.

TABLE 3: GSA, STAI FORM TX-I and STAI FORM TX-II scores of the two groups.

	Non-dipper group (n=164)	Dipper group (n=162)	P
STAI FORM TX-I score	43.3±11.9	38.3±9.2	<0.0001
STAI FORM TX-II score	35.1±13.1	35.5±9.6	0.753
GSA-12 score	14.0±4.2	13.1±3.3	0.041
STAI FORM TX-I after ABPM	37.7±12.9	37.7±10.1	0.998

ABPM: ambulatory blood pressure monitorization; GHQ-12: General Health Questionnaire; STAI:State-trait anxiety inventory.

TABLE 4: STAI FORM TX-I scores of the two groups before and after ABPM.

	STAI Form TX-I before ABPM	STAI Form TX-I after ABPM	P
Non-dipper group	43.3±11.9	37.7±12.9	<0,001
Dipper group	38.3±9.2	37.7±10.1	0,234

STAI: State-trait anxiety inventory.

terations in sympathovagal balance with reduced vagal and increased sympathetic activity during night could be responsible for non-dipping phenomenon.[17]

Anxiety is an emotional state consisting of apprehension, worry and physical changes like increased heart rate or BP. The association between anxiety and HT has been extensively analyzed. Studies examining the relationship between hypertension, anxiety and depression have produced conflicting results.[18-20] Data suggest that common pathogenic mechanisms might underlie both hypertension and anxiety disorders. These include: disturbed sleep patterns, sympathetic overactivity, elevated inflammatory cytokines and various neurotransmitter abnormalities.[21,22] The result is increase in BP, vascular resistance, plasma renin angiotensin system and angiotensin II level.[23,24] Anxiety episodes can cause short term stress related spikes in BP. A typical example is white coat hypertension characterized by high BP readings that could be due to the stress of being measured.[25] It has been proven that brief episodes of anxiety cause increase in ambulatory systolic blood pressure in healthy adults.[26]

Sunbul et al. investigated the association between depression, anxiety and abnormal nocturnal blood pressure fall in hypertensive patients. Patients' anxiety and depression level measured by hospital anxiety and depression scale. It was found that patients with non-dipper hypertension had significantly higher levels of depression and anxiety compared to the patients with dipper hypertension. In their study, smoking, alcohol usage, diabetes mellitus, dyslipidemia, anxiety score>8, and depression score>7 were independent predictors of non-dipper phenomenon.[27] Kayano et al. divided hypertensive patients according to their hospital anxiety and depression score. Nocturnal BP, early morning BP, morning BP surge and BP pattern were evaluated by using 24-hour ABPM. Patients with morning BP surge, nocturnal and early morning BP had significantly higher scores compared with controls.[28] It can be concluded from the results of these studies that anxiety and depression are the contributing factors in the pathogenesis of non-dipper phenomenon. The main difference our study from the previous reports is based on the additional assessment of situational anxiety of the hypertensive patients prior to 24-hr ABPM analysis.

24-hour blood pressure monitoring system is used extensively worldwide in the diagnosis and management of hypertension. Patients wear a device which monitors blood pressure regularly in the non-clinical settings. Major drawback of wearing "BP monitoring device" is the disturbance: patients should keep their arm immobile while their BP is taken, they should maintain a consistent posture during BP measurement and they need to keep the cuff on the arm during entire period. Use of device may lead to considerable distress. Wearing the monitor may impair the ability of patients to sleep comfortably or engage in daily activities. Viera et al. performed a study that examined the tolerability of the 24-hr ABPM among research participants.[29] Two-thirds of wearers reported that the monitor awakened them from the sleep. Most commonly reported side effects were pain, skin irritation and bruising. In another study performed by Beltman et al. it was demonstrated

that 24-hour ABPM causes problems including discomfort and inconvenience. Sixteen percent of the patients reported severe sleep disturbances during ABPM.[30]

Besides from physical disturbances, 24-hr ABPM may be a source of anxiety for some of the patients. We measured the situational anxiety of the patients prior to 24-hr ABPM assessment. Hypertensive patients with non-dipper BP profile exhibited higher levels of situational type anxiety. 24-hr ABPM may be a cause of anxiety because of the fear of what might be found, wearing an unkonwn device and/or irritation upon wearing the device. To the best of our knowledge, there is no study evaluating the effect of 24-hour ABPM on anxiety level of the hypertensive patients. Anxiety is associated with sympathetic nervous system arousal and elevated blood pressure. It may be the one of the reasons for non-dipping phenomenon. Non-dipper hypertensives had higher mean GHQ-12 scores than the dipper hypertensives, meaning they were in a poorer mental health condition. We also found that elderly, poorer and less educated patients expressed higher STAI FORM TX-I scores. Providing adequate, understandable information to the patients might have positive effects on compliance and anxiety level associated with the procedure.

CONCLUSIONS

24-hour ABPM could induce anxiety in elderly, poorer and less educated patients, providing information about the device and the process may help patients to overcome their anxiety.

LIMITATIONS

The most obvious limitation of our study was that of a small sample size. Although we did not include the patients who had the conditions that may cause non-dipping hypertension such as sleep disorders, obstructive apnea, diabetes, chronic renal disease in our study, eating habits, physical activity of the patients, and the effects of 24-hour ABPM on sleep quality were not assessed. Sleep disturbance is considered a common contributor to increased blood pressure at night. Effect of sleep disruption on non-dipper hypertension warrants further investigation.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Cennet Yıldız, Abdülmelik Yıldız, Ahmet Karakurt, Gülgün Durat, Gümrah Duygu Çulhacık;* ***Design:*** *Cennet Yıldız, Abdülmelik Yıldız, Ahmet Karakurt;* ***Control/Supervision:*** *Gülgün Durat, Gümrah Duygu Çulhacık, Ahmet Karakurt, Abdülmelik Yıldız;* ***Data Collection and/or Processing:*** *Cennet Yıldız, Abdülmelik Yıldız, Ahmet Karakurt, Gümrah Duygu Çulhacık, Gülgün Durat;* ***Analysis and/or Interpretation:*** *Cennet Yıldız, Abdülmelik Yıldız, Gülgün Durat, Gümrah Duygu Çulhacik;* ***Source Browsing:*** *Ahmet Karakurt, Gümrah Duygu Çulhacık;* ***Written by Article:*** *Cennet Yıldız, Gülgün Durat;* ***Critical Review:*** *Cennet Yıldız, Gülgün Durat, Abdülmelik Yıldız, Gümrah Duygu Çulhacık;* ***References and Fundings*** *Cennet Yıldız, Gulgün Durat, Abdülmelik Yıldız, Gümrah Duygu Çulhacık;* ***Materials:*** *Cennet Yıldız, Abdülmelik Yıldız, Ahmet Karakurt.*

REFERENCES

1. Mancia G, Laurent S, Agabiti-Rosei E, Ambrosioni E, Burnier M, Caulfield MJ, et al. Reappraisal of European guidelines on hypertension management: a European Society of Hypertension Task Force document. J Hypertens 2009;27(11): 2121-58.
2. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al; National Heart, Lung, and Blood Institute Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; National High Blood Pressure Education Program Coordinating Committee. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. JAMA 2003;289(19):2560-72.
3. O'Brien E, Sheridan J, O' Malley K. Dippers and non-dippers. Lancet 1988; 2(8607):397.
4. Hermida RC, Ayala DE, Mojón A, Fernández JR. Blunted sleep-time relative blood pressure decline increases cardiovascular risk independent of blood pressure level--the "normotensive non-dipper" paradox. Chronobiol Int 2013;30(1-2):87-98.
5. Kanbay M, Turgut F, Uyar ME, Akcay A, Covic A. Causes and mechanisms of nondipping hypertension. Clin Exp Hypertens 2008;30(7): 585-97.
6. Hojo Y, Noma S, Ohki T, Nakajima H, Satoh Y. Autonomic nervous system activity in essential hypertension: a comparison between dippers and non-dippers. J Hum Hypertens 1997;11(10): 665-71.
7. Pickering TG, Shimbo D, Haas D. Ambulatory blood-pressure monitoring. N Engl J Med 2006;354(22):2368-74.
8. Grossman E. Ambulatory blood pressure monitoring in the diagnosis and management of hypertension. Diabetes Care 2013;36 Suppl 2:S307-11.
9. Spielberger CD, Gorsuch RL, Lushenene RE. STAI Manual: for the State-Trait Anxiety Inventory, "Self-Evaluation Questionnaire. 1st ed. Pennsylvania: Consulting Psychologists Press; 1970. p.1-10.
10. Öner N, Le Compte A. Durumluk-Sürekli Kaygı Envanteri El Kitabı. 2. Baskı. İstanbul: Boğaziçi Üniversitesi; 1985. p.1-26.
11. Goldberg DP, Williams P. A User's Guide to the General Health Questionnaire. 1st ed. Windsor, UK: NFR-Nelson; 1988. p.20-35.
12. Kilic C. General Health Questionnaire: validity and reliability. Turkish Journal of Psychiatry 1996;7(1):3-9.
13. Mancia G, Parati G. Ambulatory blood pressure monitoring and organ damage. Hypertension 2000;36(5):894-900.
14. Cuspidi C, Meani S, Salerno M, Valerio C, Fusi V, Severgnini B, et al. Cardiovascular target organ damage in essential hypertensives with or without reproducible nocturnal fall in blood pressure. J Hypertens 2004;22(2):273-80.
15. Della Mea P, Lupia M, Bandolin V, Guzzon S, Sonino N, Vettor R, et al. Adiponectin, insulin resistance, and left ventricular structure in dipper and non-dipper essential hypertensive patients. Am J Hypertens 2005;18(1):30-5.
16. Grassi G, Seravalle G, Quarti-Trevano F, Dell'Oro R, Bombelli M, Cuspidi C, et al. Adrenergic, metabolic, and reflex abnormalities in reverse and extreme dipper hypertensives. Hypertension 2008;52(5): 925-31.
17. Sherwood A, Steffen PR, Blumenthal JA, Kuhn C, Hinderliter AL. Nighttime blood pressure dipping: the role of the sympathetic nervous system. Am J Hypertens 2002;15(2 Pt 1):111-8.
18. Jonas BS, Franks P, Ingram DD. Are symptoms of anxiety and depression risk factors for hypertension? Longitudinal evidence from the National Health and Nutrition Examination Survey I Epidemiologic Follow-up Study. Arch Fam Med 1997;6(1):43-9.
19. Carroll D, Phillips AC, Gale CR, Batty GD. Generalized anxiety and major depressive disorders, their comorbidity and hypertension in middle-aged men. Psychosom Med 2010;72(1): 16-9.
20. Delaney JA, Oddson BE, Kramer H, Shea S, Psaty BM, McClelland RL. Baseline depressive symptoms are not associated with clinically important levels of incident hypertension during two years of follow-up: the multi-ethnic study of atherosclerosis. Hypertension 2010; 55(2):408-14.
21. Vogelzangs N, Beekman AT, de Jonge P, Penninx BW. Anxiety disorders and inflammation in a large adult cohort. Transl Psychiatry 2013;3:e249.
22. Pickering TG. Could hypertension be a consequence of the 24/7 society? The effects of sleep deprivation and shift work. J Clin Hypertens (Greenwich) 2006;8(11):819-22.
23. Pan Y, Cai W, Cheng Q, Dong W, An T, Yan J. Association between anxiety and hypertension: a systematic review and meta-analysis of epidemiological studies. Neuropsychiatr Dis Treat 2015;11:1121-30.
24. Saavedra JM, Ando H, Armando I, Baiardi G, Bregonzio C, Juorio A, et al. Anti-stress and anti-anxiety effects of centrally acting angiotensin II AT1 receptor antagonists. Regul Pept 2005;128(3):227-38.
25. Ogedegbe G, Pickering TG, Clemow L, Chaplin W, Spruill TM, Eguchi K, et al. The misdiagnosis of hyper¬tension: the role of patient anxiety. Arch Intern Med 2008;168(22):2459-65.
26. Edmondson D, Arndt J, Alcántara C, Chaplin W, Schwartz JE. Self-esteem and the acute effect of anxiety on ambulatory blood pressure. Psychosom Med 2015;77(7):833-41.
27. Sunbul M, Sunbul EA, Kosker SD, Durmus E, Kivrak T, Ileri C, et al. Depression and anxiety are associated with abnormal nocturnal blood pressure fall in hypertensive patients. Clin Exp Hypertens 2014;36(5):354-8.

28. Kayano H, Koba S, Matsui T, Fukuoka H, Toshida T, Sakai T, et al. Anxiety disorder is associated with nocturnal and early morning hypertension with or without morning surge: ambulatory blood pressure monitoring. Circ J 2012;76(7):1670-7.

29. Viera AJ, Lingley K, Hinderliter AL. Tolerability of the Oscar 2 ambulatory blood pressure monitor among research participants: a cross-sectional repeated measures study. BMC Med Res Methodol 2011;11:59.

30. Beltman FW, Heesen WF, Smit AJ, May JF, Lie KI, Meyboom-de Jong B. Acceptance and side effects of ambulatory blood pressure monitoring: evaluation of a new technology. J Hum Hypertens 1996;10 Suppl 3:S39-42.