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ORIGINAL ARTICLE

Dream anxiety, chronotype and dipping pattern in hypertensive patients assessed with 24 h ambulatory blood pressure monitoring

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Abstract The purpose of the present study was to investigate dream anxiety, impulsivity, and chronotypes in patients with dipper/non-dipper hypertension and to compare with healthy controls. Sixty-two patients diagnosed with hypertension and 33 healthy individuals were recruited in this study. A history of current psychiatric illness or psychotropic drug usage, significant cardiac, medical or neurological disease and pregnancy were the exclusion criterias for the study. All patients and healthy controls underwent 24-h ambulatory blood pressure monitoring. The Van Dream Anxiety Scale, Morningness-Eveningness Questionnaire, Spielberger State-Trait Anxiety Inventory, Beck Depression Inventory, Barratt Impulsivity Scale and Pittsburgh Sleep Quality Index were administered to all participants. There were two groups; patients with hypertension (dipper, $n = 26$ and non-dipper, $n = 36$) and healthy controls ($n = 33$). No differences between groups among gender ($X^2 = 4.42$ and $p = 0.110$) and mean age ($F = 0.239$ and $p = 0.795$) were found. In patients with hypertension; dream anxiety, impulsivity, depression and trait anxiety scores were significantly higher than healthy controls. Sleep quality was poorer in patients with hypertension and there was no difference according to chronotype between patients and controls. There were no differences between dipper and non-dipper groups according to dream anxiety, sleep quality, impulsivity, state-trait anxiety, and depressive scores. In conclusion, dream anxiety is a previously unaddressed psychological entity that, in addition to anxiety, depression, impulsivity and poorer sleep quality, appears in hypertensive patients. Longitudinal studies with larger sample sizes would be valuable to elucidate the relationship between dream anxiety and hypertension patterns.

Keywords Hypertension · Non-dipper hypertension · Dream anxiety · Impulsivity · Sleep quality

Introduction

World authorities, such as the American Heart Association [1], have recently targeted the improvement of cardiovascular health and the reduction of deaths from cardiovascular events. Unlike improving health behaviors (e.g., diet, physical activity, and smoking) and physical risk factors (e.g., blood glucose, blood pressure, and cholesterol), psychosocial stress is not included in the strategies of reducing cardiovascular events. A substantial body of literature considers chronic stress, anxiety and depression to be potentially modifiable risk factors in cardiovascular events.

Depression and anxiety are related to blood pressure (BP) alterations, although there are some inconclusive findings in the literature that make this association more complex [2, 3]. Depression [3, 4] and anxiety [5, 6] might cause a blunted nocturnal pressure decline that is more likely in non-dippers, which is widely accepted as a risk factor for further cardiovascular events [5]. The

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pathophysiology underlying the impaired nocturnal reduction in BP is still unclear. Autonomic system dysregulation, such as increased sympathetic nervous system activity [7] and decreased parasympathetic system [8] activity, is implicated in individuals with a non-dipping BP pattern during the night [9]. Dysphoric dreams associated with autonomic arousal that may cause psychosocial distress and a higher dream anxiety score is proposed to be related to acute myocardial infarctions during sleep [10]. Interestingly, the relation between hypertension (i.e., dipper/non-dipper individuals) and dream anxiety levels is lacking in the literature.

Blood pressure fluctuation appears to have a diurnal pattern [9]. Melatonin is an endogenous antihypertensive molecule that is associated with depression and plays a role in the biological regulation of circadian rhythms [11]. Impaired nocturnal melatonin secretion is found in non-dipper hypertensive patients [11]. Frequent nightmares and related disorders, poor sleep quality, impulsivity, and risky behaviors are predominantly reported in individuals with the eveningness chronotype [12, 13]. However, there are no data on the relationship between chronotype and patients with hypertension. Therefore, in this study, we formulated two main hypotheses. First, we considered that there might be (1) higher levels of dream anxiety and impulsivity and (2) higher levels of depression and anxiety in patients with hypertension than in healthy controls. As a second hypothesis, there might be (1) more dream anxiety and impulsivity levels and (2) more depression and anxiety levels in non-dipper BP patients than in dippers. Therefore, we aimed to investigate dream anxiety, state-trait anxiety, depression, impulsivity level and chronotypes in patients with dipper/non-dipper hypertension compared with healthy controls.

Methods

Participants

The study sample consisted of 71 hypertensive patients and 33 control individuals. Patients who applied to the Marmara University Hospital cardiology outpatient clinic during a 1-year period from April 2013 to March 2014 were recruited to this study. All patients and healthy controls underwent ambulatory blood pressure monitoring (ABPM). Unfortunately, nine patients' ABPM records could not be obtained. We classified the patients with hypertension ($n = 62$) into two groups: dipper group ($n = 26$, 17 males, mean age: 46.4 ± 12.4 years) and non-dipper group ($n = 36$, 14 male, mean age 47.1 ± 11.9 years). We included patients who had clinical features such as (1) age between 18 and 60 years and (2) systolic BP $\geq$ 140 mmHg and diastolic BP $\geq$ 90 mmHg with/without antihypertensive medication.

The exclusion criteria were as follows: (1) patients with a history or current psychiatric illness or psychotropic drug use, (2) significant arrhythmia, valvular heart disease, or pacemaker implantation, (3) medical diseases such as primary kidney disease, diabetes mellitus, or sleep apnea syndrome, (4) neurological diseases such as stroke or neuromuscular disorders, and (5) pregnancies, which might be associated with blood pressure or circadian rhythm problems, were excluded from the study. In addition, night-shift workers were eliminated from the study. The local ethics committee approved the study, and written informed consent was obtained from all of the subjects.

Ambulatory blood pressure monitoring (ABPM)

Ambulatory blood pressure monitoring (AMBP) was conducted regularly every 30 min during the 24-h period, and the cuff was placed around the non-dominant arm. Patients were questioned regarding their sleep quality, and the 24-h blood pressure assessments were repeated if necessary. Nocturnal BP dipping was calculated as follows: (%) $100 \times [1 - (\text{sleep systolic BP/awake systolic BP})]$. Patients with dipper hypertension were defined as having a >10 % decrease in their systolic and diastolic BP measurements. Patients with <10 % decrease in either systolic or diastolic BPs were defined as having non-dipper hypertension [14].

The Van Dream Anxiety Scale (VDAS)

The VDAS evaluates the nightmare frequency and dream anxiety caused by frightening dreams during the preceding month. There are 17 self-rated questions in this scale. The questions from 7 to 11 are used for clinical information only and are included in the VDAS score. Twelve questions are associated with nightmare frequency, difficulty in falling asleep after a nightmare, fear of sleeping because of anticipated nightmares, trouble sleeping, dream recall frequency, sleepiness, daytime anxiety, occupational distress, familial distress, social distress, psychological disturbances, and memory/concentration problems. These 12 questions are Likert type and yield scores between 0 and 4 points. The VDAS has a good level of internal consistency (Cronbach's $\alpha = 0.87$). Pearson correlations have indicated that the question-total correlation coefficients ranges from 0.93 to 0.48 in the validation study [15].

Morningness-Eveningness Questionnaire (MEQ)

The MEQ [16] is a 19-item self-rated questionnaire providing an assessment of habitual rising and bed times, preferred times of physical and mental performance, and subjective alertness after rising and before going to bed. It is the tool most frequently used to assess chronotype, both in healthy individuals and in patients. The MEQ yields scores ranging from 16 to 86. Higher scores indicate greater morningness, and lower scores indicate greater eveningness. MEQ classifies participants who score between 59 and 86 as morning types, those who score 42–58 as neither types and those who score 16–41 as evening types. The psychometric properties of the Turkish version of the MEQ were tested by Agargun et al. (2007); its validity and reliability were found to be as high as the original version [17].

Spielberger State-Trait Anxiety Inventory (STAI)

The STAI provides a reliable measure of anxiety and contains two subscales: state anxiety and trait anxiety. The first subscale (20 items) measures state anxiety by asking subjects how they feel ''right now''. The second subscale (20 items) measures trait anxiety by asking subjects how they ''generally'' feel. Each response is assigned a score ranging from 1 to 4, indicating the severity of the symptom. The state and trait anxieties are scored separately. Both scores range from 20 to 80, with higher scores indicating a greater level of anxiety. There is no cut-off value in these tests [18]. The Turkish reliability and validity of this inventory was performed by Oner et al. [19].

Beck Depression Inventory (BDI)

The BDI is a 21-item self-report scale that is used to assess symptoms of depression. The inventory has high internal consistency (coefficient $\alpha = 0.87$) and strong evidence of validity [20]. A validity and reliability study of BDI in Turkish has been performed [21].

Barratt Impulsivity Scale (BIS-11)

The 30-item self-report (BIS-11) has three factors that assess motor impulsiveness, non-planning, and attentional impulsiveness [22]. Each item is scored with a 4-point Likert scale (from 1 to 4), with total scores ranging between 30 and 120. The BIS-11, which is correlated with other measures of impulsivity and aggression, appears to discriminate between more impulsive groups than less impulsive groups. The validity and reliability study in Turkish version of the BIS-11 was performed by Gulec et al. [23].

Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a 19-item self-rated questionnaire providing a measure of subjective sleep quality over the previous month. The 19 questions are classified into seven clinically derived component scores, each weighted equally from 0 to 3. The seven-component scores are added to obtain a global score ranging from 0 to 21, with higher scores indicating worse sleep quality [24].

Statistical analysis

The statistical analysis was performed with SPSS for Windows version 15.0 (SPSS, Inc., Chicago, IL, USA). Data are presented as the mean ± SD. The data distribution was tested with the Kolmogorov–Smirnov test. Categorical variables were analyzed with the Chi square test. For normally distributed data, a one-way analysis of variance (ANOVA) and the post hoc Tukey HSD test were used. The Bonferroni correction was made. A p value of <0.05 was accepted as statistically significant.

Results

In the current study, there were two main groups: patients with hypertension (dipper, $n = 26$, and non-dipper, $n = 36$) and healthy controls ($n = 33$), and no differences between groups with respect to gender ($X^2 = 4.42$ and $p = 0.110$), mean age ($F = 0.239$ and $p = 0.795$), and marital status ($X = 3.40$ and $p = 0.493$) were found.

Interestingly, the dream anxiety scores in patients with hypertension were significantly higher than in healthy controls ($p = 0.048$), whereas there was no difference according to chronotype between patients and controls ($X^2 = 1.82$ $p = 0.403$). In addition, sleep quality was poorer in patients with hypertension than in healthy controls ($p = 0.004$); patients with hypertension were more impulsive ($p < 0.0001$) and more depressive ($p < 0.001$), and their trait anxiety scores were higher than those of healthy controls ($p = 0.005$) (Table 1).

We divided patients with hypertension into dipper and non-dipper groups. There were no differences according to antihypertensive drug use ($n = 11$ vs $n = 19$, respectively), according to being drug-free ($n = 15$ vs $n = 17$, respectively) ($X^2 = 0.663$ and $p = 0.416$) or according to mono-antihypertensive or poly-antihypertensive treatment ($X^2 = 3.872$ and $p = 0.568$). The clinical measurements of the mean awaking and sleeping blood pressures, pulse rates and pulse pressures were insignificant between patients with dipper and non-dipper hypertension (Table 2).

Table 1 Clinical and psychometric characteristics of patients and healthy controls

	Patients with hypertension, $n = 62$	Healthy controls, $n = 33$	p value
Van dream anxiety[a]	7.69 ± 8.05	4.36 ± 6.89	$p = 0.048$*
Chronotype[b]			
Morningness	27	10	$X^2 = 1.82$
Eveningness	2	1	$p = 0.403$
Intermediate	32	22	
Pittsburg sleep quality[a]	6.13 ± 4.35	3.63 ± 2.85	$p = 0.004$**
Barratt impulsivity[c]	60.18 ± 10.77	51.45 ± 9.10	$p < 0.0001$***
State anxiety (STAI-I)[c]	46.44 ± 5.59	44.21 ± 5.71	$p = 0.070$
Trait anxiety (STAI-II)[c]	49.48 ± 5.99	45.48 ± 7.17	$p = 0.005$**
Beck Depression Scale[a]	12.18 ± 9.35	5.27 ± 4.86	$p < 0.0001$***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] With Mann–Whitney U test

[b] With Chi square test

[c] With Student's t test

Table 2 Comparison of physiological parameters between controls and dipper/non-dipper hypertension

	Dipper, $n = 26$	Non-dipper, $n = 36$	Controls, $n = 33$	p value[1]	p value[2]	p value[3]
Systolic blood pressure, total (mmHg)	131.48 ± 15.31	128.44 ± 14.24	122.72 ± 9.31	1.00	0.05	0.20
Systolic blood pressure, awake (mmHg)	135.16 ± 15.94	129.38 ± 14.78	123.96 ± 9.02	0.43	0.01*	0.25
Systolic blood pressure, sleep (mmHg)	118.00 ± 12.02	125.05 ± 15.94	118.27 ± 11.04	0.20	1.00	0.155
Diastolic blood pressure, total (mmHg)	85.40 ± 13.06	81.75 ± 11.01	78.90 ± 8.53	0.84	0.12	0.80
Diastolic blood pressure, awake (mmHg)	88.44 ± 13.03	82.72 ± 11.57	80.69 ± 8.50	0.27	0.05	1.00
Diastolic blood pressure, sleep (mmHg)	74.88 ± 12.38	78.05 ± 11.19	72.84 ± 8.65	0.73	1.00	0.15
Mean blood pressure, total (mmHg)	106.33 ± 13.90	103.14 ± 11.33	98.63 ± 7.43	0.80	0.03*	0.27
Mean blood pressure, awake (mmHg)	109.62 ± 14.12	104.17 ± 11.73	100.09 ± 7.14	0.19	0.006*	0.39
Mean blood pressure, sleep (mmHg)	94.50 ± 12.15	99.63 ± 12.39	93.63 ± 8.79	0.25	1.00	0.08
Pulse rate total (beat/min)	74.83 ± 7.85	75.66 ± 11.94	76.81 ± 11.89	1.00	1.00	1.00
Pulse rate, awake (beat/min)	77.50 ± 8.72	78.05 ± 12.96	79.51 ± 12.66	1.00	1.00	1.00
Pulse rate, sleep (beat/min)	65.25 ± 6.09	67.47 ± 9.69	67.54 ± 10.92	1.00	1.00	1.00
Pulse pressure total (mmHg)	46.17 ± 7.35	46.67 ± 11.30	43.72 ± 8.00	1.00	0.99	0.57
Pulse pressure, awake (mmHg)	46.95 ± 8.00	46.72 ± 11.76	43.24 ± 8.17	1.00	0.47	0.42
Pulse pressure, sleep (mmHg)	43.37 ± 6.47	46.91 ± 11.32	45.33 ± 8.59	0.45	1.00	1.00

One way ANOVA test was used

[1] p: dipper vs non-dipper

[2] p: dipper vs controls

[3] p: non-dipper vs controls

While comparing subgroups of patients with hypertension with healthy controls, no chronotype difference was observed within the groups ($X^2 = 2.18$ and $p = 0.702$). The mean sleep onset time ($F = 0.495$ and $p = 0.611$) and the mean awakening time ($F = 2.35$ and $p = 0.101$) did not significantly differ between the three groups and within groups (Table 3).

The mean arterial blood pressure significantly differed between the three groups ($F = 3.60$ and $p = 0.031$); the mean arterial blood pressure was significantly higher in patients with dipper hypertension than in healthy controls ($p = 0.030$), while no significance was detected between dipper and non-dipper patients with hypertension ($p = 0.809$). The mean arterial awakening blood pressure between groups was significantly different ($F = 5.14$ and $p = 0.008$); the mean arterial awakening blood pressure was significantly higher in patients with dipper hypertension than in healthy controls ($p = 0.006$), whereas it was

Table 3 The clinical and psychometric characteristics between and within groups

	Dipper group, $n = 26$	Non-dipper group, $n = 36$	Healthy controls, $n = 33$	p value[1]	p value[2]	p value[3]
Chronotype[a]						
Morningness	12	15	10	$X^2 = 2.18$ and $p = 0.702$		
Eveningness	1	1	1			
Intermediate	13	20	22			
Van dream anxiety[b]	8.12 ± 8.53	7.37 ± 7.78	4.36 ± 6.89	$p = 1.0$	$p = 0.200$	$p = 0.333$
Pittsburg Sleep Quality[b]	6.46 ± 5.14	5.89 ± 3.74	3.63 ± 2.85	$p = 1.0$	$p = 0.022$*	$p = 0.059$
Sleep onset time[b]	18.09 ± 9.21	19.67 ± 8.32	20.23 ± 7.78	$p = 1.0$	$p = 1.0$	$p = 1.0$
Awakening time[b]	7.27 ± 1.31	6.93 ± 1.58	7.66 ± 1.19	$p = 1.0$	$p = 0.86$	$p = 0.09$
Barratt impulsivity[b]	58.04 ± 9.48	61.72 ± 11.50	51.45 ± 9.10	$p = 0.489$	$p = 0.046$*	$p < 0.0001$***
State anxiety (STAI-I)[b]	46.23 ± 5.55	46.58 ± 5.70	44.21 ± 5.71	$p = 1.0$	$p = 0.532$	$p = 0.257$
Trait anxiety (STAI-II)[b]	48.08 ± 6.33	50.50 ± 5.59	45.48 ± 7.17	$p = 0.430$	$p = 0.374$	$p = 0.005$**
Beck Depression Scale[b]	10.92 ± 10.30	13.08 ± 8.64	5.27 ± 4.86	$p = 0.908$	$p = 0.028$*	$p < 0.0001$***

[1] p dipper vs non-dipper

[2] p dipper vs healthy controls

[3] p non-dipper vs healthy controls

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] With Chi square test

[b] With one Way ANOVA test

insignificant between patient groups ($p = 0.194$). There was a trend of difference between groups according to the mean sleep arterial blood pressure ($F = 2.85$ and $p = 0.063$) between groups; this slight difference originated from the difference between non-dipper patients with hypertension compared with healthy controls ($p = 0.085$), whereas no trend was observed between controls and dipper patients with hypertension ($p = 0.254$). In addition, after the Bonferroni correction, there were no differences between dipper and non-dipper groups with respect to dream anxiety, sleep quality, impulsivity, state-trait anxiety, and depressive scores (Table 2). However, patients with dipper hypertension had poorer sleep quality ($p = 0.022$), were more impulsive ($p = 0.046$) and were more depressive ($p = 0.028$) than healthy controls. The patients with non-dipper hypertension had higher trait anxiety scores ($p = 0.005$), were more impulsive ($p < 0.0001$) and were more depressive ($p < 0.0001$).

The mean impulsivity score was significantly higher in patients who were under antihypertensive treatment than in drug-free patients with hypertension (63.17 ± 12.69 vs 57.38 ± 7.81, respectively, and $p = 0.030$), and trends of worsening sleep quality (7.23 ± 4.62 vs 5.09 ± 3.88, respectively, and $Z = -1.91$; $p = 0.056$) and depression (13.57 ± 7.81 vs 10.88 ± 10.57, respectively, and $Z = -1.85$; $p = 0.064$) were detected. However, the mean dream anxiety score did not differ between antihypertensive drug receivers and drug-free patients (9.20 ± 8.47 vs 6.23 ± 7.47, respectively, and $Z = -1.57$; $p = 0.117$). Furthermore, the mean dream anxiety score between dipper and non-dipper drug-free patients was insignificant ($Z = -0.500$ and $p = 0.626$).

The dream anxiety level in patients with hypertension was positively correlated with the following: mean pulse pressure ($r = 0.335$ and $p = 0.009$), mean pulse pressure (awake: $r = 0.328$ and $p = 0.011$; sleep: $r = 0.280$ and $p = 0.032$), trait anxiety ($r = 0.303$ and $p = 0.018$), sleep quality ($r = 0.352$ and $p = 0.005$), depressive score ($r = 0.340$ and $p = 0.007$) and duration of hypertension ($r = 0.270$ and $p = 0.035$). The mean dream anxiety score in healthy controls was positively correlated with the depression scores ($r = 0.584$ and $p < 0.0001$) and sleep quality ($r = 0.615$ and $p < 0.0001$).

Discussion

In the current study, patients with hypertension had more dream anxiety levels and more impulsivity scores and poorer sleep quality than healthy controls had. Unexpectedly, no differences were observed between dipper and non-dipper hypertensive patients regarding impulsivity,

dream anxiety and sleep quality. Additionally, state and trait anxiety and depression levels were higher in both dipper and non-dipper patients than in healthy controls, while trait anxiety was also higher in non-dipper patients than in healthy controls.

In the literature, we could not find any studies on dream anxiety in patients with hypertension. Sleep can have an important influence on cardiovascular function and is a period of decreased physiologic workload for the cardiovascular system [25]. Insomnia is a risk factor for cardiovascular diseases [26]. Recently, higher nightmare frequency and higher autonomic hyperactivity have been reported in patients who had an acute myocardial infarction (AMI) during sleep than in awake AMI patients [10]. Nightmares are suggested to produce autonomic arousal during REM sleep [27]; the autonomic nervous system directly affects the vasomotor tonus; and sympathetic activity occurs during REM sleep [28]. Furthermore, sleep fragmentation and sleep deprivation are related to cardiovascular diseases [29]. In the current study, we detected a positive correlation between dream anxiety and poor sleep quality. Additionally, depressive and trait anxiety scores were significantly higher in patients with hypertension than in healthy controls. Depression and anxiety have been reported as independent risk factors for hypertension [6]. In our study, we revealed a positive correlation between dream anxiety and depression and trait anxiety. In addition to other risk factors, we propose that the dream anxiety level may be one of the contributors to possible cardiovascular events in patients with hypertension.

In the current study, patients with hypertension were more impulsive than healthy controls. A few studies evaluating impulsivity in patients with hypertension have reported that personality features such as impulsivity partially account for the hypertension etiology [30]. In a recently published study, the eveningness type had a 1.3-fold odds ratio for arterial hypertension ($p < 0.05$ after controlling for sleep duration or sleep sufficiency), compared with morning types [31]. Interestingly, we could not find any difference between hypertensive patients and healthy controls based on morningness and eveningness chronotypes. In addition, both awakening and sleep onset time were not different between groups, either. However, the small sample size should be considered while interpreting this finding. In addition, the average age in the hypertensive patients was close to 50 years; moreover, there is a shift toward dominance of the morningness chronotype in older adults, while the eveningness chronotype is observed more frequently in adult age groups [32]. Therefore, investigating chronotypes in adult patients with hypertension would be more explanatory.

Patients with non-dipper hypertension were expected to have greater cardiovascular risk than patients with dipper hypertension, whereas the relationship between the non-dipping/dipping pattern and psychiatric symptoms remains controversial [6]. Poor sleep quality is associated with a non-dipping pattern even in normotensive people [33] and hypertensive patients [34]. However, we did not observe a difference based on sleep quality between dipper and non-dipper hypertensive patients. In the literature, the effect of dream anxiety on dipper and non-dipper hypertensive patients is also lacking. In the present study, against our second hypothesis, we did not find a difference based on dream anxiety levels between dipper and non-dipper patients with hypertension. We considered that dream anxiety levels do not influence dipping or non-dipping patterns in patients with hypertension. In addition, although Sunbul et al. [6] have reported higher anxiety and depressive levels in patients with non-dipper hypertension, we did not reach this outcome in the current study. Thus, psychological factors appear not to contribute to dipping and non-dipping patterns in patients with hypertension. The experts commonly suggest a 7-day/24-h ABPM for a definitive diagnosis of dipping or non-dipping patterns, particularly in older adults, because of possible variability within days and between days [35, 36]. Recently, Otsuka et al. (2014) showed that the rate of blood pressure disruption is more frequent in older adults than at younger ages (10.3 vs 2.5 %) [36]. Unfortunately, we performed 24-h ABPM in all participants who were older adults. In addition, we might not have differentiated both masked non-dipping and masked dipping patterns because of the 24-h ABPM in this study. Furthermore, we found mildly higher depression scores in the non-dipper group compared with the dipper group (13.08 ± 8.64 vs 10.92 ± 10.30, $p = 0.908$), and even mild depression is considered to influence the blood pressure variability within a day [35]. Thus, the method we have used and the characteristics of our sample might have yielded the indifferent findings regarding dream anxiety and sleep quality in our study.

In this study, we found poorer sleep quality in patients with dipper hypertension than in healthy controls, whereas no difference was detected between non-dipper hypertension and healthy controls. In two previous studies, poor sleep quality was associated with a non-dipping pattern in hypertensive patients [34] and in normotensive people who exhibit a blunted night-time blood pressure drop [33]. However, some studies have not reported an association between sleep quality and the non-dipping pattern [37, 38]. In our investigation, we did not subclassify dipper patients with hypertension as extreme dipper and dipper. Comparing these subgroups of dipper hypertension with healthy controls would be valuable whether an extreme drop in blood pressure causes poorer sleep quality. Additionally, trait anxiety was higher in non-dipper patients than in healthy controls but did not differ between dipper patients

and healthy controls. In two recently published studies, anxiety levels were reportedly higher in non-dipper patients than in dipper patients with hypertension [6, 39]. In these studies, the Hospital Anxiety Depression Scale, which assesses anxiety within a few days, was used. Our investigation revealed higher trait anxiety levels, rather state anxiety levels, in non-dipper patients, which is in line with the published knowledge that chronic anxiety is important in cardiovascular health [1].

This study has several limitations. First, not evaluating the activity levels of the participants during the day and night times might be an important limitation. Second, a longitudinal assessment of dream anxiety and other psychometric evaluations might support more information than would a cross sectional design. Third, we could not evaluate the patient chronotypes because of the relatively small sample sizes of the hypertensive sub groups.

In conclusion, dream anxiety is a previously unaddressed psychological entity that, in addition to anxiety, depression, impulsivity, and poorer sleep quality, appears in hypertensive patients. However, dream anxiety appears to be independent of the dipping/non-dipping pattern in our study. Longitudinal studies with larger sample sizes would be valuable to elucidate the relationship between dream anxiety and hypertension patterns and may offer insights into the unclear etiology of non-dipper hypertension.

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SLEEP AND BIOLOGICAL RHYTHMS
THE JAPANESE SOCIETY OF SLEEP RESEARCH

Overview

Sleep and Biological Rhythms is a quarterly peer-reviewed publication dealing with medical treatments relating to sleep. The journal publishies original articles, short papers, commentaries and the occasional reviews. In scope the journal covers mechanisms of sleep and wakefullness from the ranging perspectives of basic science, medicine, dentistry, pharmacology, psychology, engineering, public health and related branches of the social sciences.

Aims and Scope

Sleep and Biological Rhythms is the official journal of the Japanese Society of Sleep Research, and publishes original research articles dealing with sleep and wakefulness, including biological rhythms. Papers in basic science, medicine and social science relating to sleep and/or biological rhythms will be considered for publication. Both members and non-members of the Japanese Society of Sleep Research are welcome to submit papers to the journal.

Keywords

Sleep, biological, rhythms, sleep research, wakefulness, social science, Japanese Society, basic science, psychiatry, sleep apnea, sleep deprivation, neurology, neuroscience, respiratory, medicine, respirology, neuropsychiatry

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