

Prevalence and Prevention of Headaches Caused by Sleep Disorders

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Abstract The article deals with the prevalence of various types of headaches caused by sleep disorders and measures for their early prevention.

Keywords Headache, Sleep disturbance, Apnea, External environmental factors, Prevention, Spread

1. Relevance

Sleep is an integral part of life and one of the basic human needs, and sleep disorders are a significant clinical problem. Almost 50% of the population suffers from some kind of disorder sleep. Sleep disorders are closely associated with both diseases of the nervous system and mental disorders, but patients suffering from such diseases prefer to seek help from neurologists. Sleep disorders affect more than 45% of the world's population and have become a global health problem in recent decades. And from this point of view, headaches included in number of the most common complaints: according to the World Health Organization, they affect 50–75% of the adult population. That's why headache, and sleep disorders have become global health problem. In everyday clinical practice, the most common syndrome is characterized by insomnia, various sleep disorders and subsequent daytime awakenings and resulting headaches. Primary headaches include migraines, tension headaches, cluster headaches, and other less common variants. The connection between headaches and sleep disorders is multifaceted. On the one hand, headaches can be a consequence of sleep disturbances; a typical example is hypnotic headache. On the other hand, lack of sleep can lead to headaches. The first large-scale epidemiological study was conducted in Denmark to assess the incidence of comorbidity between headache and sleep disorders. 68,518 people took part in the survey, most of them under the age of 55 (80% responded offline, 20% online). 18.1% of people had headache and insomnia at the same time (the high frequency of comorbidity of these diseases is associated with

common pathophysiological mechanisms). Another 16.3% suffered only from headaches, and 21.1% only had trouble sleeping. Comorbid pathology was more often observed in women and middle-aged people. Other risk factors include low socioeconomic status, unhealthy lifestyle (overweight /obesity), high stress levels, anxiety and depression. Sleep disturbances can be acute (transient), short-term (up to 6 months) and chronic (more than 6 months). Acute sleep disturbances can occur in any person under the influence of stress or overexcitation due to time zone change. Chronic insomnia develops in people prone to it. Typically, this condition affects elderly patients, women, people who, for one reason or another, sleep no more than 5 hours a day, as well as people who have not worked for a long time, divorcees, those with psychological and mental trauma, and patients. chronic diseases. The most common complaint of patients is difficulty falling asleep. A person experiences the desire to sleep before going to bed, but disappears when a person goes to bed under the influence of various factors. These may be unpleasant thoughts and memories, discomfort in the legs, pain or itching, or the inability to find a comfortable position due to extraneous sounds. Light drowsiness is disturbed by even the slightest noise, and sometimes a falling asleep person feels as if he “didn’t sleep for a minute.”

There can be many reasons for difficulty falling asleep, including lack of fatigue, staying in bed for long periods of time during the day, irregular bedtimes, and medical conditions that cause swelling, itching, or pain. The researchers concluded that patients with headaches and sleep disorders should be actively identify in clinical practice. Lifestyle changes, stress reduction, and screening for depression and anxiety can go a long way in treating and preventing the combination of headaches and sleep disorders.

Apnoe

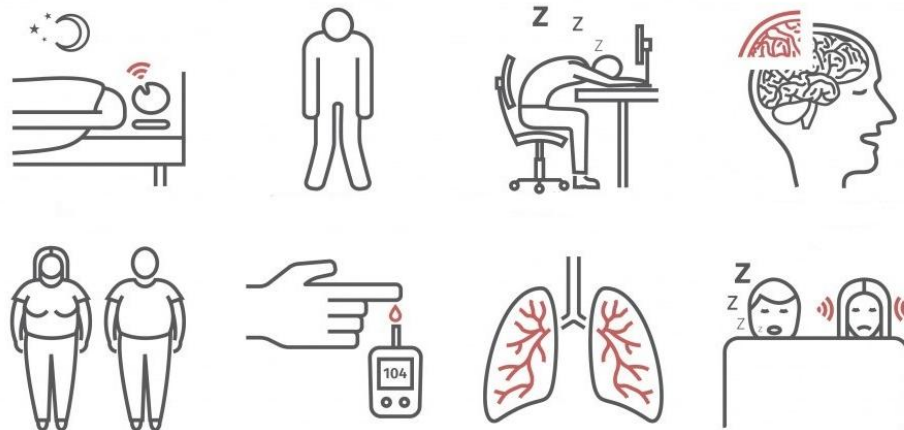


Figure 1

Sleep disorder and pain often appears in as a concomitant pathology, seriously worsening the health and reducing the quality of life of patients (Table 1) [1]. Many studies have noted a positive correlation between pain intensity and degree of sleep disturbance. In addition, it has been shown that the structure of sleep disturbances in chronic pain and primary insomnia is similar. Various relationship options are being considered headaches and sleep disorders. Firstly, both phenomena can develop on the common basis of systemic pathology (anemia, hypoxemia), be independently comorbid with a number of metabolic disorders (obesity, type 2 diabetes), have common causes and provocateurs (emotional stress, anxiety and depressive disorders). Secondly, both conditions can influence each other, but there is no consensus on that in which grade. Some researchers believe that sleep disorders in greatly increase the risk of developing headache rather than pain the syndrome provokes a disorder sleep. A typical example is hypnic headache. In patients with insomnia, two to three times increased risk of developing migraines and tension headaches, as well as chronic daily headache

According to PH Finan, for chronic pain syndrome disorder sleep was recorded in 67–88% of patients, and insomnia complaints only 50% reported pain participants. It has been shown that the degree of manifestation of sleep disorders correlates with an increased prevalence of headache. However, painful stimuli themselves do not explain sleep disturbances to the extent that they are reported. reported by patients with headaches pain. This is because painful stimuli during sleep in healthy people lead only to short-term cortical arousals and postural adjustments without significant sleep disturbances or flashbacks about poor sleep the next day. Chronic pain is associated with increased system activity, modulating ascending activation and nociception, and also disrupts sleep microarchitecture.

Purpose of the study: to improve existing examination methods by identifying a group of patients with sleep disorders, by comparing headaches among patients treated with primary headaches caused by sleep disorders and vegetative-vascular dystonia, asthenic type of quality of life assessment.

Table 1

Type of headache	Sleep disturbance
Migraine	Insomnia
	Parasomnias (night terrors, somnambulism)
	Restless legs syndrome
	Bruxism
Cluster headache	Central and obstructive sleep apnea syndromes
Hypnic headache	Night awakenings (hypnic headache is associated with sleep disturbances by definition)
Tension headache	Insomnia
Chronic daily headache	Insomnia Obstructive sleep apnea syndrome

2. Materials and Research Methods

Using modern examinations and neuropsychological tests that identify sleep disorders, diagnostic examinations and neuropsychological tests were carried out to determine sleep disorders in 133 groups of patients of both sexes aged 18-59 years with a diagnosis of “Primary headaches” and “Vegetative-vascular dystonia”, asthenia, based on examinations, Primary headaches. To determine the comparative level of sleep disturbances in patients suffering from pain and vegetative-vascular dystonia, asthenic diagnostics and EEG studies of higher nervous activity are used. At the stage of studying the characteristics of the somnological status, patients with excess body weight (BMI 25–29) and a

diagnosis of “metabolic syndrome” were selected based on one main and two additional criteria (HOMA-IR resistance index ≥ 2.77 , glucose level in fasting blood plasma ≥ 5.1 mmol/l). Additional criteria were high-density lipoprotein level < 1.2 mmol/l, low-density lipoprotein level > 3.0 mmol/l, triglycerides ≥ 1.7 mmol/l, urinary albumin excretion level > 20 mcg/min., blood pressure 140/90 mmHg Art., ratio of waist circumference to hip circumference > 0.85 . Two clinical groups were formed: I - main (77 patients with excess body weight, BMI 25-29, ambi-LPPA) and II - control (71 patients with normal weight, BMI 18-24, ambi-LPPA-A). To study the somnological status, the “Questionnaire for scoring subjective characteristics of sleep” (modification of the Spiegel questionnaire) was used (with a score of < 19 points, sleep disorders were diagnosed). Sleep-disordered breathing was identified using the Sleep Apnea Screening Questionnaire (a score of 4 points indicated breathing disturbances). The level of daytime sleepiness was determined using the Epworth Sleepiness Scale (1990) (5–9 points indicated severe daytime sleepiness). Somnographic examination of patients was carried out using the software and hardware complex “Encephalan-EEGR-19/26” at night. An electroencephalogram (EEG), electrocardiogram (ECG), electrooculogram (EOG), electromyogram (EMG) of the hypoglossal muscle, respiratory rate (RR), pulse oximetry, and actigraphy were recorded. The EEG was recorded monopolarly using the 10/20 system in symmetrical frontal, temporal, central, parietal and occipital leads with a time constant of 0.3 sec. EEG analysis was carried out on epochs lasting 20 s while determining frequency-amplitude and spectral characteristics using the fast Fourier transform method and determining sleep events using the cluster method. The index of severity of EEG frequency ranges was calculated: delta activity (0.5–2 Hz), delta 2 activity (2–4 Hz), theta activity (4–8 Hz), alpha activity (8–12 Hz), sigma activity (12–18 Hz), beta activity (18–36 Hz), as well as localization of the maximum amplitude of EEG rhythms for each stage of sleep. EEG characteristics were studied while awake with eyes closed before sleep, in all phases of sleep and after awakening. The structure of sleep (phases, cycles, stages, hypnograms) was assessed using EEG, EMG, ECG and RR indicators. Sleep efficiency (SE) was determined in minutes using the formula: $ES = (DS+DD)/(LS+SB)$, where: DS - total sleep duration, DD - delta sleep duration, LPS - latent value of sleep onset, SV - time wakefulness inside the night. The lower the ES value, the more productive the sleep was considered. At the same time, segmental sleep indicators were assessed by calculating the number of segments (areas of homogeneous sleep depth) in sleep stages. The proportion of segments in each stage was determined with a total stage duration of 100%. In addition, the number and duration of different types of intersegmental episodes in sleep stages were determined.

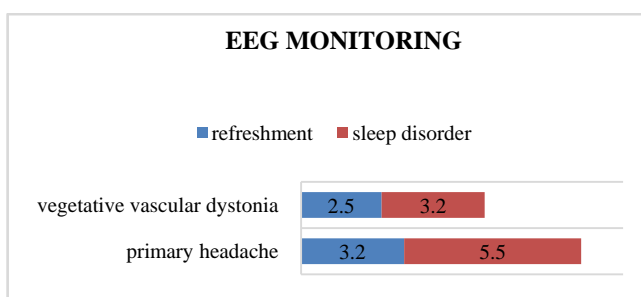
SPIEGEL SLEEP subjective scale questionnaire:

SPIEGEL SLEEP SUBJECTIVE RATING SCALE

Table 2

Question	for primary headaches	vegetative-vascular dystonia
Before bed	2	4
Sleep duration	2	3
Number of awakenings at night	2	3
Sleep quality	3	4
Number of dreams	3	4
Quality of morning awakening	3	4
Total:	15	22

Table 3



Note: $p < 0.05$

3. Results of the Study

So, it can be seen that when conducting the Spiegel Sleep Disorders Scale, a total of 15 sleep disturbance points were obtained in groups of 43 patients with primary headache. In a group of 3–9 patients with an asthenic diagnosis of VSD, this indicator was 22 points. In our following table, the high rates of headaches caused by sleep disorders were 5.5 points for primary headaches and 3.2 points for patients with an asthenic diagnosis of VSD.

Table 4. Indicators of tests for studying the characteristics of somnological status in patients with excess and normal body weight with an ambilateral behavioral profile of asymmetries (pregravid period ($M \pm m$))

Tests to study somnological status	Groups of patients examined		R
	Group I (n=43)	Group II (n=41)	
Sleep quality questionnaire Sleep Quality Questionnaire	17.1 \pm 2.1	24.5 \pm 1.9	0.04129
Sleep apnea/hypopnea syndrome questionnaire Sleep apnea/hypopnea questionnaire	7.9 \pm 1.8	2.0 \pm 1.3	0.0453
Sleepiness Scale (Epworth) Sleepiness scale (Epworth)	6.4 \pm 1.2	3.7 \pm 0.3	0.0306

Note: $p < 0.05$ - statistically significant differences between groups

Based on higher scores on the sleep apnea scale, sleep disorders were more often observed in patients of group I. When assessing polysomnographic indicators reflecting an

objective picture of sleep, which include characteristics of the cardiorespiratory system, a decrease in the frequency and amplitude of breathing was found against the background of a decrease in heart rate in the slow-wave phase of sleep in patients in group I compared with patients in group II. In addition, episodes of increased heart rate variability were identified in the paradoxical sleep phase and in the first and second stages of slow-wave sleep. However, in the second and fourth stages of slow-wave sleep in overweight patients, episodes of relative heart rate stability were recorded.

Statistically significant differences were identified in the maximum and minimum heart rate during sleep in patients of clinical group I, which, along with breathing disorders during sleep, will inevitably contribute to other symptoms. potologies (Table 5).

Table 5. Features of the functional activity of the cardiorespiratory system during sleep in patients with excess and normal body weight

Indicators of the cardiorespiratory system of women during a polysomnographic study	Group I (n= 43)	Group I (n= 41)	R
Average heart rate while awake, beats/ min.	82.0	75.2	0.0531
Average heart rate during sleep, beats/ min.	73.7	65.1	0.0632
Minimum heart rate, beats/ min.	64.9	50.2	0.0458
Maximum heart rate, beats/ min. <i>Maximum heart rate, bpm</i>	139.0	92.3	0.0315
Average heart rate on top. cne (1st+2st), beats /min.	58.3	64.9	0.2371
Average heart rate in delta sleep (3st+4st), beats/ min.	67.2	60.4	0.2421
Average heart rate in the PFJ, beats/min	81.6	72.2	0.4257
Apnea index	2.8	0.7	0.0444
Apnea/hypopnea index	10.6	3.9	0.0263
Minimum blood oxygen saturation, %	87.1	95.6	0.0252
Duration of desaturations, sec.	136.4	30.1	0.0069
Number of snoring episodes	514.7	85.6	0.0072
Average heart rate while awake, beats/ min.	82.0	75.2	0.0531

Note: $p < 0.05$ - statistically significant differences between groups

Among the subjects, there were 73 (64.4%) respondents with NS and hypertension (main group), 71 (23.8%) with hypertension without NS (comparison group), and 16 (1.4%) with NS without GB and 15 (1.3%) - without NS and GB. During the survey, 65.8% of respondents noted pondents (rarely 53.8%; often 12%). NS were more common in women than in men (59% versus 41%, respectively; $\chi^2 = 7.990$; $df = 1$; $p = 0.004$), as well as in respondents with concomitant diseases, compared with respondents without them (57, 8% versus 41.7%, respectively; $\chi^2 = 25.844$; $df = 1$; $p < 0.001$), including in participants with high blood pressure compared to respondents with normal blood pressure (29.2% versus 13.1%, respectively; $\chi^2 = 35.673$; $df = 1$; $p < 0.001$). The frequency

of NS increased with the age of the participants: permanent NS - 49.6 ± 15.7 years; frequent - 43.5 ± 15.1 years; rare - 39.8 ± 13.9 years; without NS - 34.8 ± 12.2 years; $F = 21.13$; $p < 0.001$). Among NS, difficulties falling asleep were observed in 15.5% of respondents, frequent awakenings at night - in 9.8%, waking up early in the morning - in 9.9%, low quality of sleep - in 12.8%; several of the listed NS - in 52%. 30.2% of respondents took sleeping pills (4.4% of them frequently). The respondents in the main group turned out to be significantly older than the participants in the comparison group (40.8 ± 14.2 years versus 34.9 ± 12.3 years; $F = 46.42$; $p < 0.001$), women predominated among them (59.4% versus 50.5%, respectively; $\chi^2 = 7.646$; $df = 1$; $p = 0.008$), in the main group there were more rural residents (42.3% versus 33.6%, respectively; $\chi^2 = 6.886$; $df = 1$; $p = 0.008$), people with concomitant diseases (58.5% versus 42.9%, respectively; $\chi^2 = 23.517$; $df = 1$; $p < 0.001$), including patients with high blood pressure (29.5% versus 13.7%, respectively; $\chi^2 = 23.517$; $df = 1$; $p < 0.001$). GB among respondents with NS, it occurred more often (8-14 days per month - 13.2% versus 6.3%; $\chi^2 = 12.061$; $df = 1$; $p < 0.001$; more than 14 days per month - 7.4% versus 3%; $\chi^2 = 8.357$; $df = 1$; $p = 0.003$), was more pronounced (30.2% versus 19.4%; $\chi^2 = 14.558$; $df = 1$; $p < 0.001$), polymorphic (20.8% versus 11.2%; $\chi^2 = 15.061$; $df = 1$; $p < 0.001$), more often lasted up to 12 hours (92.4% vs. 85.7%; $\chi^2 = 15.410$; $df = 1$; $p < 0.001$), affecting several areas heads (18.4% versus 13.4%; $\chi^2 = 4.501$; $df = 1$; $p = 0.033$). In the comparison group, headaches were more often of a stabbing nature (6.3% versus 3.2%; $\chi^2 = 5.614$; $df = 1$; $p = 0.01$), lasting from 12 to 24 hours (13.4% versus 6.4%. table 6). This circumstance confirms the data of a previous study, in which respondents with NS showed better awareness of the rules of sleep hygiene [2]. The results of the study of respondents without NS and with NS (rarely and often/ constantly) showed that frequent and chronic headache was more often observed with frequent NS ($p < 0.001$) (Table 5). In terms of intensity, headache was more pronounced and severe in such respondents ($p < 0.001$). NS was significantly more often observed in rural residents ($p < 0.01$), women ($p = 0.01$) and respondents with concomitant diseases (including high blood pressure) ($p < 0.001$); in participants with NS, the contribution of psycho-emotional factors increased ($p < 0.001$), headache affected several areas of the head ($p < 0.04$) or half of it ($p < 0.04$). In respondents without NS compared with those with NS, headaches occurred rarely ($p < 0.001$), had weak intensity ($p < 0.001$), and were localized in one area of the head ($p < 0.04$). Therapeutic measures to relieve hypertension (taking analgesics, antihypertensive drugs, rest) were used with the same frequency in the compared groups ($p > 0.05$). This study made it possible to obtain new evidence of the discovered facts of previously conducted epidemiological work on the study of NS and HD in the population [2,3,4], in particular their high prevalence among residents of the republic. The identified connections between NS and headache are confirmed in the literature [2,5,6,7]. Thus, in foreign epidemiological studies, NS was correlated with more frequent and severe headaches.

Table 6. Sleep characteristics in the examined groups, %

Index	Main group (n =43)	Comparison group (n=41)	χ^2	p
Duration of night sleep, h				
<5	11.7	6.3	8,730	0.12
6—8.5	76.8	81.1		
>9	11.5	12.6		
Sleep during the day				
No	92.4	85.7	26,812	<0.001
Sometimes	6.4	13.4		
often	1.2	0.9		
Taking sleeping pills				
do not accept	69.8	93.2	78.8	<0.001
rarely	25.8	6.8		
often	4.3	-		
constantly	0.1	-		

Table 7. Hypertension in the groups examined with NS, %

GB	NS				
	no (n=381)	rarely (n=600)	often (n=134)	χ^2	P
GB frequency					
usually doesn't happen	3.8	1.9	1.5	4,722	Nd
less than once a month	54.8	38.9	21.1	52,066	<0.001
1-7 days per month	32.5	42.4	42.1	10,419	0.005
8-14 days per month	6.0	11.3	20.3	22,324	<0.001
more often than 14 days a month	2.9	5.5	15.0	27,324	<0.001
Intensity GB					
weak	24.3	14.3	8.3	24,301	<0.001
moderate	52.3	50.8	44.3	2,508	Nd
pronounced	19.1	29.0	34.6	16,789	<0.001
very strong	4.3	5.9	12.8	12,323	0.002
Duration of GB, h					
up to 12	96.4	92.4	85.7	15,410	<0.001
from 12 to 24	3.0	6.4	13.4	16,273	<0.001
more than 24	0.6	1.2	0.9	0.677	Nd
GB localization					
not specified	2.3	0.8	2.2	0.212	Nd
one area of the head	58.3	55.3	44.8	7,330	0.025
several areas of the head	12.9	17.2	21.7	6,454	0.039
half head	7.6	6.9	13.4	6.625	0.036
whole head	18.9	19.8	17.9	0.312	Nd

Note. Nd - unreliable

In addition, in patients of clinical group I there was a decrease in the prevalence of REM sleep phases with an increase in the duration of episodes of wakefulness during the night. The number of sleep cycles in patients of the main and control groups did not differ significantly and amounted to an average of 5 cycles ($p = 0.07$). However, there were differences in the duration of the cycles: in patients of group I, the second cycle was the longest ($p = 0.03$), in patients of group II, the third cycle was the longest ($p = 0.04$). In the

process of assessing the phase relationship in cycles. When analyzing the relationship of phases in sleep cycles, it was found that in patients of clinical group I, the slow-wave phase predominated in all sleep cycles, however, the severity of the slow-wave phase due to shallow sleep in the fourth and fifth cycles was greater, and the paradoxical phase was less than in patients in the control group groups. In patients of clinical group II, in the first three cycles the slow-wave phase predominated, while in the fourth and fifth cycles the

paradoxical phase dominated, that is, in the first three cycles of sleep in the slow-wave phase, its deep stages predominated, while in the fourth and fifth cycles of sleep - superficial stages of sleep.

4. Conclusions

In conclusion, it should be said that primary headaches due to sleep disorders, vegetative-vascular dystonia, compared with sleep disorders of the asthenic type, formed a high rate.

Thus, early diagnosis of sleep disorders in patients with primary headaches and vegetative-vascular dystonia is important for improving the quality of life and maintaining labor productivity, and early treatment and preventive measures are important for various types of headaches that occur in patients. pain is prevented.

The data obtained indicate the possibility of identifying the category of patients with excess body weight using lateral typing. The results obtained on sleep disturbances in overweight patients with ambi-LPPA at the pregravid stage, which, on the one hand, are the result of hormonal changes against the background of existing metabolic and autonomic abnormalities in patients.

Preventive measures in patients should be avoided primarily from stress, psycho-emotional stress, various weather conditions, people working in various professions, especially those working at night, should develop a daily routine, diet, diet and food should contain sufficient amounts of minerals and vitamins.

Various painkillers and sleeping pills give us temporary relief, but cannot eliminate the root cause.

Therefore, patients with various sleep disorders need to consult a specialist (neurologist, psychoneurologist, somnologist, psychiatrist) and receive the necessary recommendations.

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