ARTYKUŁ ORYGINALNY / ORIGINAL RESEARCH ARTICLE

Occurrence of insomnia among patients with diagnosed obstructive sleep apnea

Występowanie bezsenności wśród chorych z rozpoznaniem obturacyjnego bezdechu sennego

Marek Daniłosio[1], Jarosław Wysocki [2], Monika Prus[3]

[1]The State School of Education, Chełm, Poland
[2]Medical Department, Lazarski University, Warsaw, Poland
[3]Department of Otolaryngology, Medical University of Warsaw, Warsaw, Poland

Article history: Received: 20.06.2017 Accepted: 24.08.2017 Published: 30.03.2018

ABSTRACT: Obstructive sleep apnea (OSA) is a common problem. Excessive daytime sleepiness raises a suspicion of OSA, which can be confirmed by polysomnography (PSG). Insomnia, in patients with OSA, often manifests itself as excessive daytime drowsiness. The incidence of insomnia among patients with OSA differs in different studies. Thus, we investigated the incidence of insomnia among our patients. We included 120 patients who underwent a workup due to a suspicion of OSA in the Polysomnography Laboratory, Department of Otolaryngology, Medical University of Warsaw, Poland. Patients completed the Athens Insomnia Scale (AIS). All-night PSG was done with 14-channel recordings (Grass®, USA). The severity of OSA was classified according to the apnea-hypopnea index (AHI) values. There were 96 patients with OSA and 24 patients without OSA who served as controls (their sleep disorders and daytime drowsiness were not caused by OSA). The total AIS scores tended to indicate insomnia in the entire sample and in all different subgroups. The mean AIS score was significantly different between the subgroups differing in the severity of apnea. The mean AIS score correlated significantly with sleep latency, latent sleep, and N2 latency. The mean AIS score did not correlate significantly with the AHI. In conclusion, in patients with OSA, insomnia, measured with the AIS, was associated with the severity of apnea, although this relationship was weak.

KEYWORDS: obstructive sleep apnea, insomnia, Athens insomnia scale, correlation with sleep variables

STRESZCZENIE: Obturacyjny bezdech senny (OBS) jest problemem medycznym o zasięgu społecznym. Podstawą jego podejrzenia i postawienia rozpoznania jest nadmierna senność dzienna oraz wynik polisomnografii (PSG). Bezsenność towarzyszy pacjentom z OBS równie często jak nadmierna senność dzienna, aczkolwiek częstość występowania bezsenności jest różnie określana w różnych badaniach. Postanowiono poddać weryfikacji te poglądy w oparciu materiał własny. Materiał stanowiło 120 pacjentów zgłaszających się do Pracowni Polisomnograficznej Katedry i Kliniki Otolaryngologii WUM z podejrzeniem obturacyjnego bezdechu sennego. Pacjenci rutynowo wypełniali kwestionariusz Ateńskiej Skali Bezsenności (Athens Insomnia Scale; AIS). Całonocna PSG była wykonywana na sprzęcie firmy Grass, z zapisem 14-kanałowym. Ocena badania była dokonywana metodą automatyczno-manualną. Ciężkość OBS klasyfikowano na podstawie AHI. Utworzono grupę badawczą liczącą 96 chorych z rozpoznanym OBS oraz grupę kontrolną, którą stanowiło 24 pacjentów, u których wykluczono OBS, a ich zaburzenia snu oraz nadmierna senność dzienna wynikały z innych przyczyn. Suma punktów z ankiety AIS we wszystkich podgrupach oraz łącznie była bliska znamiennej lub znamienna dla rozpoznania bezsenności. Średni wynik w AIS różnił się istotnie w podgrupach według ciężkości bezdechu, korelował także w sposób istotny statystycznie latencją zasypiania, latencją pełnego snu i latencją fazy N2, ale nie z AHI. Wyciągnięto wniosek, według którego u chorych z rozpoznaniem OBS nasilenie bezsenności mierzonej z zastosowaniem AIS ma istotny związek z ciężkością bezdechu, aczkolwiek nie jest to związek ścisły.

SŁOWA KLUCZOWE: obturacyjny bezdech senny, bezsenność, Ateńska Skala Bezsenności, korelacja z parametrami snu

INTRODUCTION

Obstructive sleep apnea (OSA) is a common disease affecting more than 10% of people in the developed countries [1]. OSA considerably reduces quality of life, diminishes productivity, and causes absenteeism at work [2, 3]. Moreover, excessive daytime sleepiness and attention disorders due to OSA cause serious accidents [4]. Patients with OSA often have insomnia, although insomnia and OSA are considered as opposing disorders. However, OSA and insomnia may co-exist (sleep apnea plus) [5], and this co-morbidity has been investigated for over 40 years [6].

Insomnia is the most common chronic sleep disorder in the general population [7]. It may be a symptom of another disease or a disease on its own [8]. Chronic insomnia is an important social problem because it is common and leads to negative consequences. According to epidemiological data, sleep disorders affect about 1 in 3 adults in the Western industrialized countries [9]. Moreover, about 6% to 15% of people in the general population have clinical insomnia [10, 11].

Clinically, insomnia can be diagnosed based on specific criteria set out by three qualification systems: DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, IV Edition), ICD-10 (International Classification of Diseases, 10th Revision), and ICSD (International Classification of Sleep Disorders, RDC - Research Diagnostic Criteria for Insomnia). These systems, albeit differing in some details, take into account three aspects: difficulties in falling asleep, maintaining sleep, and waking up too early [12]. These sleep disturbances make people feel unrested, fatigued, and deprived of energy [13].

Although researchers agree that insomnia is considerably more frequent among patients with OSA than in the general population, the figures differ in different studies. A retrospective analysis of data from a health insurance agency in the USA (National Ambulance Medical Care Survey and National Hospital Ambulatory Medical Care Survey), from 1995 to 2010, showed that 6.4% of patients with OSA had co-existing insomnia [14]. In clinical trials, insomnia occurred in 6% to as much as 57.6% of patients with OSA [10, 11, 15]. In the United States National Health and Nutrition Examination Survey (NHANES) involving 12047 people, 43% of patients with OBS had co-existing insomnia, compared with 30% in people without OSA [16].

The occurrence and severity of insomnia in patients with OSA does not seem to depend on OSA severity. Some studies reported a higher incidence of insomnia among patients with severe OSA [17, 18, 19] or mild apnea [20]. Other studies did not find any relationship between the occurrence of insomnia and OSA severity [5, 15]. These discrepancies are due to different methods used in different studies, particularly due to different criteria for diagnosing insomnia [13].

Some investigators put forward that coexistence of OSA and insomnia may cause an additive effect [14, 20], but others oppose this view. Sivertsen et al. [11] reported that insomnia was

Tab I. Athens Insomnia Scale

Please, check (by circling the appropriate number) the items below to indicate your estimate of any difficulty, provided that it occurred at least three times per week during the last month.

1) Time it takes you to fall asleep after turning-off the lights
1. No problem
2. Slightly delayed
3. Markedly delayed
4. Very delayed or did not sleep at all

2) Awakenings during the night
1. No problem
2. Minor problem
3. Considerable problem
4. Serious problem or did not sleep at all

3) Final awakening earlier than desired
1. Not earlier
2. A little earlier
3. Markedly earlier
4. Much earlier or did not sleep at all

4) Total sleep duration:
1. Sufficient
2. Slightly insufficient
3. Markedly insufficient
4. Very insufficient or did not sleep at all

5) Overall quality of sleep:
1. Satisfactory
2. Slightly unsatisfactory
3. Markedly unsatisfactory
4. Very unsatisfactory or did not sleep at all

6) Sense of well-being during the day:
1. Normal
2. Slightly decreased
3. Markedly decreased
4. Very decreased

7) Functioning (physical and mental) during the day:
1. Normal
2. Slightly decreased
3. Markedly decreased
4. Very decreased

8) Sleepiness during the day:
1. None
2. Mild
3. Considerable
4. Intense

Tab. II. List of variables analyzed and numeric codes assigned to them.

VARIABLE CODE	VARIABLE NAME
1	sex
2	age
3	BMI
4	N1 phase duration of total sleep duration (%)
5	N2 phase duration of total sleep duration (%)
6	N3 phase duration of total sleep duration (%)
7	REM phase duration of total sleep duration (%)
8	subgroups 1-4 according to AHI
9	subgroups 1-3 and 4 according to AHI
10	AHI
11	SO2nadir
12	latency of falling asleep
13	latent sleep
14	N2 latency
15	REM latency
16	sleep effectiveness
17	awakening index
18	arousal index
19	total score in the Athens Insomnia Scale

significantly associated with self-reported previous stroke, but not ischemic heart disease or myocardial infarction. Vozoris and Bjornsdottir [15, 16], however, observed that patients with OSA did not have an increased cardiovascular risk. In a retrospective study among 7,234 patients [14], patients with OSA and co-existing insomnia had a significantly higher risk for hypertension and cerebrovascular diseases than those without insomnia.

Patients with OSA and co-existing insomnia are less often overweight or obese than patients with OSA alone [14, 16]. This is noteworthy particularly because, as mentioned above, patients with OSA and co-existing insomnia have a higher cardiovascular risk than those with insomnia, and excessive body mass is one of the most well-known cardiovascular risk factors [14]. Thus, the high cardiovascular risk in patients with OSA and co-existing insomnia seems to be independent of body weight. However, some investigators [15, 21] did not find significant differences in BMI between patients with OSA and co-existing insomnia and those with insomnia alone. Others found that patients with OSA and co-existing insomnia had a higher mean body weight than patients with insomnia alone. Residents of nursing homes who had both OSA and insomnia had a significantly greater neck circumference and BMI than those with insomnia alone [22].

Tab. III. Descriptive statistics for age, BMI, and sleep quality variables for the entire sample and for men and women separately. The arithmetic mean and standard deviation (in brackets) are marked in bold, the range is shown below. P values <0.05 are marked in bold (next to the Mann-Whitney U test value).

GROUP / VARIABLE	WOMEN (N = 23)	MEN (N = 97)	TOTAL (N = 120)	P
Age	51,61 (10,6) 32–72	48,82 (12,25) 19–78	49,36 (12,00) 19–78	0,3131
BMI	27,14 (3,09) 22,27–36,98	28,52 (3,31) 19,05–47,34	28,25 (3,32) 19,05–47,34	0,0052
N1	9,47 (5,32) 3,0–27,0	15,34 (10,03) 0,7–58,3	14,21 (9,59) 0,7–58,3	0,0033
N2	67,02 (12,46) 34–84,3	68,43 (11,62) 40,2–88,4	68,16 (11,8) 34–88,4	0,7860
N3	15,77 (8,21) 2,9–35,3	11,31 (10,38) 0,0–40,9	12,7 (10,5) 0–40,9	0,0085
REM	7,11 (5,83) 0,0–26,6	4,93 (4,14) 0,0–16,0	5,35 (4,6) 0–26,6	0,1084
AHI	16,87 (15,42) 0,3–56,8	35,67 (28,1) 0,8–107,4	32,04 (27,17) 0,3–107,4	0,0028
SO2nadir	86,22 (5,11) 76,0–96,0	82,84 (6,9) 59,0–97,0	83,48 (6,73) 59–97	0,0428
Latency of falling asleep	31,54 (40,05) 6,5–157,0	15,78 (13,76) 0,5–83,5	18,8 (22,34) 0,5–157	0,0257
Latent sleep	48,91 (45,41) 7,0–175,0	41,61 (37,25) 0,0–240,0	43,01 (39,06) 0–240	0,7058
N2 latency	34,39 (40,46) 6,5–157,0	19,77 (18,11) 4,5–97,0	22,58 (24,74) 4,5–157	0,0706
REM latency	148,2 (95,0) 0,0–404,0	132,74 (84,38) 0,0–364,5	135,7 (86,73) 0–404	0,8219
Sleep efficiency	76,64 (16,29) 21,8–94,3	77,94 (14,63) 19,9–96,1	77,69 (14,97) 19,9–96,1	0,8116
Awakening index	6,19 (6,42) 0,8–34,1	8,5 (8,57) 0,6–69,6	8,06 (8,25) 0,6–69,6	0,0842
Arousal index	7,75 (9,53) 0,0–38,3	11,3 (10,4) 0,0–44,7	10,2 (10,34) 0–44,7	0,0918

Legend: N1, N2, N3, REM - sleep phase (% of total sleep duration), sleep efficiency (% of study duration), SO2 nadir (% of oxygen saturation), sleep phase latencies (in minutes), indices of awakenings and arousals (counts/ hours of sleep).

In some studies, among patients with OSA, those with insomnia and those without insomnia did not differ with regard to age [5, 20, 22, 23] and sex [5, 23]. In one study [20], among patients with OSA, women had insomnia more often than men (51.4% vs. 48.6%). In another study [21], these proportions were reversed.

In this study, we analyzed the occurrence of insomnia in patients who underwent a workup for suspected OSA in our polysomnography laboratory.

Tab. IV. Descriptive statistics for age, BMI, and sleep quality variables in subgroups according to AHI. The arithmetic mean and standard deviation (in brackets) are marked in bold, the range is shown below. P values <0.05 are marked in bold (next to the values of the Kruskall-Wallis test)

GROUP/ VARIABLE	AHI <5 (N=24)	5 ≤AHI <15 (N = 22)	15 ≤AHI <30 (N = 17)	AHI ≥30 (N = 57)	P
Age	45,42 (11,73) 29–65	64,32 (11,15) 19–66	52,18 (11,78) 33–72	51,35 (11,81) 29–78	0,1335
BMI	26,08 (2,34) 19,05–29,92	26,85 (2,28) 21,1–31,07	30,68 (5,16) 25,3–47,34	28,98 (2,42) 24,49–36,11	0,0000
N1	10,34 (6,22) 0,7–28,7	9,88 (5,66) 3,1–27,0	11,53 (5,87) 1,3–22,0	18,32 (11,06) 2,9–58,3	0,0002
N2	64,72 (12,11) 42,1–86,7	65,36 (14,36) 34,0–88,4	68,33 (10,18) 49,0–84,3	70,65 (10,33) 41,1–88,2	0,1936
N3	17,32 (10,33) 0,0–38,8	17,61 (11,27) 3,0–40,9	14,84 (10,07) 4,2–39,7	7,1 (6,51) 0,0–24,2	0,0000
REM	7,03 (6,15) 0,0–26,6	7,17 (4,5) 0,4–16,0	5,31 (3,97) 0,0–13,6	3,95 (3,41) 0,0–15,1	0,0166
AHI	2,48 (1,47) 0,3–4,7	9,9 (2,35) 5,6–14,1	21,15 (4,06) 15,0–29,3	55,89 (19,5) 30,0–107,4	
SO2 nadir	89,96 (3,28) 84,0–97,0	86,5 (3,81) 76,0–93,0	81,71 (7,33) 59,0–89,0	80,12 (5,98) 65,0–89,0	0,0000
Latency of falling asleep	15,45 (11,96) 3,3–44,0	19,8 (13,44) 0,5–50,5	13,86 (9,53) 5,5–42,5	21,29 (29,58) 2,5–157,0	0,5184
Latent sleep	31,71 (20,55) 5,0–68,0	42,34 (23,58) 6,5–98,0	31,62 (30,34) 0,0–107,0	51,43 (48,79) 5,0–240,0	0,1751
N2 latency	19,99 (17,57) 4,8–68,5	21,3 (13,55) 5,0–50,5	15,65 (11,02) 7,0–45,0	26,22 (31,94) 4,5–157,0	0,5286
REM latency	116,35 (69,13) 0,0–279,5	134,59 (66,28) 24,5–317,0	133,97 (80,94) 0,0–275,0	144,79 (99,67) 0,0–404,0	0,7055
Sleep efficiency	81,85 (9,63) 59,8–94,3	78,43 (11,89) 54,0–96,1	75,44 (16,5) 26,2–95,3	76,32 (16,91) 19,9–96,1	0,6719
Awakening index	8,62 (13,74) 0,6–69,6	5,71 (2,62) 1,2–14,1	7,31 (5,54) 1,2–24,9	8,96 (6,98) 1,4–34,1	0,1310
Arousal index	5,28 (7,81) 0,0–28,5	5,6 (6,7) 0,0–22,6	5,34 (5,12) 0,0–17,7	16,38 (10,53) 2,3–44,7	0,0000

Legend: N1, N2, N3, REM - sleep phase (% of total sleep duration), sleep efficiency (% of study duration), SO2 nadir (% of oxygen saturation), sleep phase latencies (in minutes), indices of awakenings and arousals (counts/ hours of sleep). We did not perform the Kruskall-Wallis test to compare groups distinguished based on the mean AHI.

MATERIALS AND METHODS

We included 120 patients who underwent a workup for OSA in the Polysomnographic Laboratory, Department of Otolaryngology, Medical University of Warsaw, Poland. Based on polysomnography (PSG), there were 96 patients with OSA (80 men and 16 women; age range, 19 to 78 years; mean age, 50.34 years.) and 24 patients without OSA who served as controls (17 men and 7 women; age range, 29 to 65 years; mean age, 45.42 years). Sleep disturbances in the controls were not caused by OSA.

The occurrence or absence of insomnia was assessed with the Athens Insomnia Scale (Table I). The AIS assesses the severity of insomnia based on the diagnostic criteria defined by the International Classification of Diseases (ICD-10). The AIS evaluates eight aspects of sleep: the beginning of sleep, course of sleep at night, involuntary early awakenings, sleep time, sleep quality, frequency and duration of symptoms, discomfort caused by insomnia, and the impact of insomnia on daily functioning. It takes only 3 to 5 minutes to complete the AIS (Shahid). The Internal consistency of the AIS ranges from 0.87 to 0.89, and the test-retest reliability, from 0.88 to 0.89; thus, the AIS has a high diagnostic value (Soldatos).

The answer to each item is scored from 0 (insomnia is not a problem) to 3 points (insomnia is a serious problem). According to the authors of AIS (Soldatos et al.), a total score of at least

6 points distinguishes patients with insomnia and controls in 90% of cases (Soldatos, Szelenberger Nowak).

The severity of OSA was classified based on the apnea-hypopnea index (AHI). Overnight polysomnography was performed with 14-channel recordings, including electroencephalography (EEG), electromyography (EMG), and recordings of chest and abdominal movements (Grass®, USA). Airflow through the airways was recorded with a nasal-oral thermal sensor. Polysomnography was assessed with an automatic-manual method: the sleep stages were coded manually by a technician, separately for each 30-second intervals, according to criteria of the American Academy of Sleep Medicine (AASM).

The elementary matrix containing the results of 120 observations was converted: the variables describing the patients and their sleep were coded. An EXCEL spreadsheet was used for preliminary data preparation, and all statistical analyzes were performed with the STATISTICA 10 software. Based on the Shapiro-Wilk test, most variables were not normally distributed. Thus, we used nonparametric analyzes for all data. The Mann-Whitney test was used for independent variables with two categories; otherwise, the median test and the Kruskal-Wallis test were used. The Spearman's rank correlation coefficient was used for all correlations. The statistical significance of the correlation coefficients was tested with an appropriate Student's t test. Finally, we performed stepwise regression. Table II presents the variables analyzed.

RESULTS

Table III presents sleep characteristics, age, and BMI for both sexes. There were several statistically significant differences between men and women. Compared to women, men had higher BMIs and greater values of the main PSG parameters (AHI, SO2nadir, and arousal index), which indicates more severe OBS in men.

Table IV presents sleep characteristics, age, and BMI for patients with different AHIs.

AHI significantly differentiated subgroups in terms of SO_2 nadir, percentage of REM sleep time, N1 and N3, arousal index, and BMI. Thus, AHI is the basic parameter determining the quality of sleep. Table V presents the results of the AIS questionnaire.

The total scores in the AIS indicated insomnia or was near to indicating insomnia both in all subgroups and in the entire sample.

Table VI presents the correlation analysis. The AIS scores did not correlate significantly with any of the sleep variables. We found only three significant correlations between sleep variables (variables: 12-14 [latency of sleep, latent sleep, N2 latency]), which is consistent with the symptoms reported by patients.

Tab. V. Total scores in the Athens Insomnia Scale for the entire sample and for subgroups differentiated by sex and AHI. The arithmetic mean and standard deviation (in brackets) are marked in bold, the range is shown below. P values < 0.05 are marked in bold (next to the values of the Kruskall-Wallis test).

SUBGROUP	AIS SCORE	SIGNIFICANCE OF THE DIFFERENCE (P)
Women (N = 23)	7,96 (4,67) 0–20	0,7911
Men (N = 97)	7,87 (4,95) 0–19	
AHI<5 (N = 24)	6,92 (4,86) 0–19	0,3810
5 ≤AHI <15 (N = 22)	7,45 (5,64) 0–20	
15 ≤AHI <30 (N = 17)	7,94 (4,8) 2–19	
AHI ≥30 (N = 57)	8,44 (4,53) 1–19	
Total (N = 120)	7,88 (4,91) 0–20	

Table VI

DISCUSSION

The AIS evaluates the symptoms of insomnia; it has been validated for the Polish population and has good psychometric properties. A total AIS score of 8 or more indicates a non-organic insomnia with a high likelihood (in accordance with the ICD-10 criteria). Because the AIS is concise, reliable, and accurate, it is useful in both clinical practice and research [24].

Based on the AIS scores, our patients tended to have considerable problems with sleep (the cutoff for insomnia according to the AIS's authors is 6 points, but other researchers use 8 points as the cut-off value; the mean AIS score in our study was 7.88 points). There were no significant differences in the AIS scores between men and women. Previous research showed that women more than men complain of insomnia, although men and women have a similar severity of OSA (measured with the AHI) [25]. Although there were no significant differences in insomnia between patients with different AHIs in our study, patients with severe OSA had the highest insomnia scores. In our study, the patients with OSA did not differ from the controls; perhaps because the controls were not healthy people and indeed had sleep problems.

The AIS scores correlated positively with the latency of falling asleep, latent sleep, and N2 latency, which suggests that the

Tab. VI. Spearman rank correlation coefficients for the correlations between the analyzed variables. The statistically significant values are marked in bold.

ZMIENNA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1,00	0,09	-0,25	-0,27	-0,03	0,24	0,15	-0,21	-0,21	-0,27	0,19	0,20	0,03	0,17	0,02	-0,02	-0,16	-0,15	0,02
2	0,09	1,00	0,21	0,17	0,21	-0,35	-0,01	0,19	0,14	0,12	-0,25	0,25	0,22	0,19	0,02	-0,46	0,24	-0,07	0,09
3	-0,25	0,21	1,00	0,21	0,15	-0,34	-0,11	0,43	0,32	0,44	-0,46	0,00	0,01	-0,05	-0,02	-0,16	0,28	0,15	-0,03
4	-0,27	0,17	0,21	1,00	-0,32	-0,47	-0,13	0,38	0,40	0,41	-0,26	0,19	0,32	0,32	-0,00	-0,33	0,33	0,31	-0,03
5	-0,03	0,21	0,15	-0,32	1,00	-0,53	-0,38	0,20	0,18	0,20	-0,20	-0,08	-0,07	-0,15	0,00	-0,06	0,12	0,18	0,14
6	0,24	-0,35	-0,34	-0,47	-0,53	1,00	0,17	-0,47	-0,48	-0,49	0,39	-0,04	-0,18	-0,07	-0,02	0,26	-0,35	-0,35	-0,14
7	0,15	-0,01	-0,11	-0,13	-0,38	0,17	1,00	-0,27	-0,27	-0,31	0,15	0,01	-0,07	-0,03	-0,05	0,24	-0,28	-0,34	-0,03
8	-0,21	0,19	0,43	0,38	0,20	-0,47	-0,27	1,00	0,92	0,94	-0,64	-0,00	0,10	0,05	0,09	-0,07	0,22	0,59	0,16
9	-0,21	0,14	0,32	0,40	0,18	-0,48	-0,27	0,92	1,00	0,86	-0,54	-0,01	0,12	0,06	0,07	-0,03	0,20	0,60	0,14
10	-0,27	0,12	0,44	0,41	0,20	-0,49	-0,31	0,94	0,86	1,00	-0,64	-0,05	0,04	0,01	0,07	-0,03	0,23	0,65	0,12
11	0,19	-0,25	-0,46	-0,26	-0,20	0,39	0,15	-0,64	-0,54	-0,64	1,00	0,04	0,07	0,03	-0,03	0,09	-0,22	-0,33	0,02
12	0,20	0,25	0,00	0,19	-0,08	-0,04	0,01	-0,00	-0,01	-0,05	0,04	1,00	0,56	0,89	0,12	-0,60	0,10	-0,05	**0,20**
13	0,03	0,22	0,01	0,32	-0,07	-0,18	-0,07	0,10	0,12	0,04	0,07	0,56	1,00	0,63	0,13	-0,58	0,29	0,11	**0,23**
14	0,17	0,19	-0,05	0,32	-0,15	-0,07	-0,03	0,05	0,06	0,01	0,03	0,89	0,63	1,00	0,18	-0,57	0,05	0,05	**0,24**
15	0,02	0,02	-0,02	-0,00	0,00	-0,02	-0,05	0,09	0,07	0,07	-0,03	0,12	0,13	0,18	1,00	-0,04	-0,04	0,02	0,07
16	-0,02	-0,46	-0,16	-0,33	-0,06	0,26	0,24	-0,07	-0,03	-0,03	0,09	-0,60	-0,58	-0,57	-0,04	1,00	-0,52	0,10	-0,14
17	-0,16	0,24	0,28	0,33	0,12	-0,35	-0,28	0,22	0,20	0,23	-0,22	0,10	0,29	0,05	-0,04	-0,52	1,00	-0,04	0,05
18	-0,15	-0,07	0,15	0,31	0,18	-0,35	-0,34	0,59	0,60	0,65	-0,33	-0,05	0,11	0,05	0,02	0,10	-0,04	1,00	0,09
19	0,02	0,09	-0,03	-0,03	0,14	-0,14	-0,03	0,16	0,14	0,12	0,02	**0,20**	**0,23**	**0,24**	0,07	-0,14	0,05	0,09	1,00

AIS might be useful in studying insomnia among patients with OSA. Insomnia is associated with extended latency of falling asleep, reduced total sleep duration, and increased daytime sleepiness [26, 27].

Because the AIS and AHI scores were not correlated, insomnia severity seems not to be directly related to OSA severity. Our results are similar to previous research on insomnia and OSA. In a study with 228 patients with mild apnea, there was no relationship between insomnia and AHI; thus, although insomnia is a common complaint in patients who undergo PSG, insomnia severity is not related to the incidence of respiratory problems during sleep [20].

The Icelandic Sleep Apnea Cohort Study [15] showed that 57.6% of patients with OSA confirmed by PSG (n = 824) had insomnia, compared with 31% in well-matched controls (n = 762). In that study, insomnia was diagnosed based on 2 questions from the Basic Nordic Sleep Questionnaire („I have problems with falling asleep," I have often waken up at night during this month"). In that study, patients indicated their responses on a 5-point scale (from „never or almost never" to „every day or almost every day of the week"), and the total score of ≥ 4 indicated insomnia.

In the Norwegian Hordaland Health Study (n = 6892), 7.3% of patients with OSA had insomnia, compared to 4.9% of those without OSA [11]. That study used robust diagnostic criteria; the symptoms of insomnia had to last longer than a month, and the diagnosis of insomnia was based on the Karolinska Sleep Questionnaire (this questionnaire includes 4 categories, each scored on a 5-point scale: „never", „rarely", „sometimes", „often", „ always „, meaning, for instance, several times a year, a month, or a week). Insomnia was diagnosed when at least 1 point was scored in each of the categories: falling asleep, maintaining sleep, waking up early, or a combination of the above in combination with disturbances in everyday work [28].

In a study among 394 women with chronic post-menopausal insomnia, 67% of patients had OSA (AHI ≥ 5) [29].

In another study, among 200 residents of nursing homes, about 30% of those with insomnia had OSA as well (AHI ≥ 15); however, as many as 38% of those without insomnia also had OSA [22].

In another study, patients with both OSA and insomnia had milder sleep apnea (AHI, 46) than patients with OSA alone (AHI, 58). In that study involving 231 patients, insomnia was diagnosed when patients said „yes" to at least 2 of the 3 fol-

lowing questions: „do you need more than 30 minutes to fall asleep", „do you awaken frequently", and „do you have difficulties with falling back asleep" [5].

Finally, we want to stress that there have been fundamental discrepancies between the studies on OSA and insomnia performed to date. One study, which used the Insomnia Severity Index Score (ISIS) questionnaire, showed a strong correlation (r = 0.79) between the AHI and ISIS scores (the ISIS takes into account the duration of sleep disorders - at least 6 months, sleep latency or sleepless time on PSG - at least 30 minutes, and at least one insomnia-dependent daily disorder) [18, 19]. In another study, based on the same questionnaire, such a correlation was not found [20].

We conclude that, in patients with OSA, the severity of insomnia, measured with the AIS, is related to the severity of apnea, but this relationship is weak.

References

1. Young T., Finn L., Peppard P.E. et al.: Sleep Disordered Breathing and Mortality: Eighteen-Year Follow-up of the Wisconsin Sleep Cohort. Sleep Biol. Rhythms. 2008; 31: 1071–1078.
2. Mulgrew A.T., Ryan C.F., Fleetham J.A. et al.: The impact of obstructive sleep apnea and daytime sleepiness on work limitation. Sleep Med. 2007; 9: 42–53.
3. Baldwin C.M., Griffith K.A., Nieto F.J. et al.: The association of sleep-disordered breathing and sleep symptoms with quality of life in the Sleep Heart Health Study. Sleep. 2001; 24: 96–105.
4. Mulgrew A.T., Nasvadi G., Butt A. et al.: Risk and severity of motor vehicle crashes in patients with obstructive sleep apnoea/hypopnoea. Thorax. 2008; 63: 536–641.
5. Krakow B., Melendrez D., Ferreira E. et al.: Prevalence of insomnia symptoms in patients with sleep-disordered breathing. Chest. 2001; 120: 1923–1929.
6. Guilleminault C., Eldridge F.L., Dement W.C.: Insomnia with sleep apnea: a new syndrome. Science. 1973; 181: 856–858.
7. Ford D.E., Kamerow D.B.: Epidemiologic study of sleep disturbance and psychiatric disorders: an opportunity for prevention? JAMA. 1989; 262: 1479–1484.
8. Buysse D.J., Germain A., Moul D.E.: Diagnosis, epidemiology, and consequences of insomnia. Primary Psychiatry. 2005; 12: 37–44.
9. Sateia M.J.: Update on sleep and psychiatric disorders. Chest. 2008; 135: 1370–1379.
10. Ohayon M.M.: Epidemiology of insomnia: what we know and what we still need to learn. Sleep Med. Rev. 2002; 6: 97–111.
11. Sivertsen B., Bjornsdottir E., Overland S., Bjorvatn B., Salo P.: The joint contribution of insomnia and obstructive sleep apnoea on sickness absence. J. Sleep Res. 2013; 22: 223–230.
12. American Psychiatric Association. Task Force on DSM-IV Diagnostic and statistical manual of mental disorders: DSM-IV. 4th ed. XXVII. Washington, DC 1994.
13. Luyster F.S., Buysse D.J., Strollo P.J.: Comorbid insomnia and obstructive sleep apnea: challenges for clinical practice and research. J. Clin. Sleep Med. 2010; 6: 196–204.
14. Gupta M.A., Knapp K.: Cardiovascular and psychiatric morbidity in obstructive sleep apnea (OSA) with insomnia (Sleep Apnea Plus) versus obstructive sleep apnea without insomnia: A case-control study from a nationally representative US sample. PLoS ONE. 2014; 9: e90021.
15. Björnsdottir E., Janson C., Gislason T., Sigurdsson J.F. et al.: Insomnia in untreated sleep apnea patients compared to controls. J. Sleep Res. 2012; 21: 131–138.
16. Vozoris N.T.: Sleep apnea-plus: prevalence, risk factors, and association with cardiovascular diseases using United States population-level data. Sleep Med. 2012; 13: 637–644.
17. Bianchi M.T., Williams K.L., McKinney S., Ellenbogen J.M.: The subjective-objective mismatch in sleep perception among those with insomnia and sleep apnea. J. Sleep Res. 2013; 22: 557–568.
18. Smith S., Sullivan K., Hopkins W., Douglas J.: Frequency of insomnia report in patients with obstructive sleep apnoea hypopnea syndrome (OSAHS). Sleep Med. 2004; 5: 449–456.
19. Smith O.R.F., Michielsen H.J., Pelle A.J., Schiffer A.A. et al.: Symptoms of chronic fatigue in chronic heart failure patients: clinical and psychological predictors. Eur. J. Heart Failure. 2007; 9: 922–927.
20. Krell S.B., Kapur V.K.: Insomnia complaints in patients evaluated for obstructive sleep apnea. Sleep Breath. 2005; 9: 104–110.
21. Lichstein K.L., Durrence H.H., Reidel B.W. et al.: Primary versus secondary insomnia in older adults: subjective sleep and daytime functioning. Psychol. Aging. 2001; 16: 264–271.
22. Gooneratne N.S., Gehrman P.R., Nkwuo J.E. et al.: Consequences of comorbid insomnia symptoms and sleep-related breathing disorder in elderly subjects. Arch. Intern. Med. 2006; 166: 1732–1738.
23. Chung K.F.: Insomnia subtypes and their relationships to daytime sleepiness in patients with obstructive sleep apnea. Respiration. 2005; 72: 460–465.
24. Fornal-Pawłowska M., Wołyńczyk-Gmaj D., Szelenberger W.: Walidacja Ateńskiej Skali Bezsenności. Psychiatria Pol. 2011; 45: 211–221.
25. Shepertycky M.R., Banno K., Kryger M.H.: Differences between men and women in the clinical presentation of patients diagnosed with obstructive sleep apnea syndrome. Sleep. 2005; 28: 309–314.
26. Foley D.J., Monjan A.A., Brown S.L. et al.: Sleep complaints among elderly persons: An epidemiologic study of three communities. Sleep. 1995; 18: 425–432.
27. Schneider D.L.: Safe and effective therapy for sleep problems in the older patient. Geriatrics. 2002; 57: 24–35.

Word count: 2700 Tables: 6 Figures: – References: 27

Access the article online: DOI: 10.5604/01.3001.0011.6685 Table of content: https://otorhinolaryngologypl.com/issue/10687

Corresponding author: Jarosław Wysocki Ph, MD: Medical Faculty, Lazarski University, 02-662 Warsaw, ul. Świeradowska 43, Poland; E-mail: j.wysocki@lazarski.edu.pl

Competing interests: The authors declare that they have no competing interests.

Cite this article as: Daniłosio M., Wysocki J., Prus M.: Occurrence of insomnia among patients with diagnosed obstructive sleep apnea; Pol Otorhino Rev 2018; 7(1): 16-23