A Rank Order Evaluation Of Complaints In Patients Suspected Of Sleep Apnea Syndrome

R Goldstein, I Shpirer, D Stav, J Askenasy

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Abstract

In 1164 patients suspected of sleep apnea syndrome (SAS), the polysomnography confirmed SAS in 58.6%. The range-order analysis of their complaints evidenced that the average number of complaints was 3.7 and the more frequent complaints were placed earlier in the complaints list. According to their mean scores, there were four complaints places: 1) snoring; 2) insomnia, breathing arrest, gasping and excessive daytime somnolence (EDS); 3) headaches and nausea-vomiting, and 4) memory trouble and erectile dysfunctions. The total number of complaints was significantly correlated with both the apnea index and oxygen desaturation. Snoring, breathing arrest and total number of complaints were higher in patients with confirmed SAS, breathing arrest, EDS and insomnia scores in more severe forms of SAS while headache, erectile dysfunctions and nausea-vomiting scores in central SAS. Such a rank order evaluation of the complaints may be a useful tool for detecting SAS, and for predicting the SAS type and intensity.

INTRODUCTION

Sleep-related breathing disorders (SRBD) are encountered in-between 1 and 5% of the general population, snoring being the first risk factor for developing sleep apnea syndrome (SAS) ([1]). Untreated SRBD shows an increased risk of car accidents due to increased daytime somnolence and premature death due to cardiovascular complications. Patients with complaints possibly induced by SAS should be further evaluated since CPAP and other treatment lead to significant improvement. When is evaluation necessary? Among all the patients' complaints are those suggesting SRBD, which requires a further investigation? Loud snoring, breathing cessation or gasping during sleep observed by relatives, excessive daytime sleepiness (EDS), headache in the morning, non-refreshing sleep and nocturnal choking sensations in obstructive SAS ([17]) or EDS or insomnia in central SAS ([2,3,18]) are also well known signs indicating SAS. Numerous studies analyzed in a various ways their predictive value for SAS or their power to support a further sleep investigation ([11,12,13,14,15,16]). However, no study performed an analysis of these symptoms according to their place in the whole list of patients' complaints. That is why, in the present study we performed a ranked-order analysis for the predictive value for SAS of the main complaints in a very large population suspected from SAS, referred to a sleep center.

MATERIAL AND METHODS

STUDY SUBJECTS

The study was performed on 1164 patients, referred to our Sleep Center for suspicion of SAS during the last 5 years (age>18 years - mean age 46.3±11.6y, range 18-81y, 88.7% male). Inclusion criteria were: age over 18 years, and a complete and correct completion of a questionnaire detailing their complaints and personal data.

STUDY DESIGN

We tried to obtain some predictive evaluation from the patient's rank order complaints. The main assumption was that a complaint is more intense (more important for the patient or more disturbing) if it is between the first, and inverse, if a complaint is less important is between the last. Therefore, each complaint received a rank power, which was inverse related to the complaint rank from all the complaints. If a patient had five complaints and snoring was the first one recorded, then snoring received a rank power of 5. If it was the second, its rank power was 4, etc. In this kind of evaluation, if a patient had a single complaint, i.e. snoring, the complaint received a rank power of 1 as in the case of a patient with 8 complaints where the snoring was the last recorded complaint. To prevent the influence of the complaint number on this evaluation, we expressed the rank power in ratio between the complaint rank power and the

total number of complaints (i.e. if a patient had five complaints and snoring was the first recorded, then snoring received a rank power of 5/5=1, if it was the second, its rank power was 4/5=0.8, etc.). The value varies between 0 (the complaint not present) to 1 {the complaint is the first).

METHODS

All the patients were polysomnographycally (PSG) evaluated for at least one night. A Nikon-Kohden Neuropolygraph with 18 channels recorded EEG (2-4 leads), EOG, EMG of the submentalis muscle, EKG, pulse oxymeter (for evaluation of capillary blood oxygenation), the oro-nasal airflow, and intercostal EMG for respiratory effort. Two additional EMG electrodes applied on right and left tibialis anterior recorded leg movements. Sleep stages were scored according to the classical accepted criteria ($_4$). Sleep apnea was considered when the apnea-hypopnea index (AHI) was greater than 5. AHI<15 was defined as mild, between 15 and 35 as moderate and >=35 as severe. If more than 75% from all apnea-hypopnea were obstructive, the SAS was defined as obstructive (OSAS), if were central, the SAS was defined as central (CSAS), else the SAS was considered mixed (MSAS).

ANALYSIS

The data were analyzed by analysis of variance (ANOVA), followed by Bartlett's test for homogeneity of variance. If this showed the variance in a sample to differ, a non-parametric Chi-square equivalent test, the Kruskal-Wallis H test, was used. The percent values were analyzed by the Chi-square comparison test. The correlation was evaluated using the classical Pearson's “r” coefficient of correlation. The statistical analysis was carried out with EPI 5-5.0 software ($_5$)

RESULTS

Out of all 1164 referred patients, 58.6% were confirmed as suffering from SAS. Among them, 81.4% were OSAS, 14.3% MSAS and 4.2% CSAS. According to the intensity, 45.1% were mild, 32.2% moderate and 22.7% severe SAS. The average number of complaints was 3.7 (range 1 to 8, median 4). The main complaints, in order of their frequency are presented in Table 1. A good concordance between the complaint frequency and its rank order score was detected. More frequent a complaint, it was placed more former in the complaints list. The single exception was insomnia (Table 1). According to the frequency, insomnia was the fourth, but its average rank order score was the third (after snoring and fatigue) and, according to “without 0” score, the second place. This signifies that, although less frequent, when present, is the second after snoring.

Figure 1

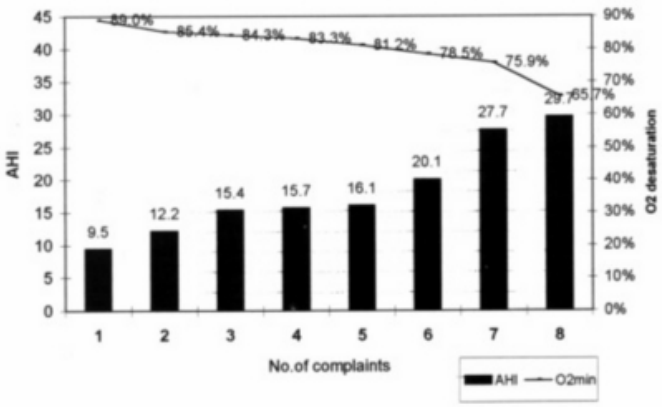
Table 1 The frequency and average rank order (RO) score of the patients complaints (mean Â± SD). The Â“without 0Â” score represents the mean of complaint score only in patient where the complaint was present (the number between parentheses represents the number of patient with the complaint present)

Complaints	Frequency	Av. RO score	Av. RO score (without 0)
Snoring	96.3%	3.40±1.6	3.52±1.4(1121)
Fatigue	66.7%	1.38±4J2	2.06±0.9 (777)
EDS	53.5%	0.73±0.9	1.36±0.7 (673)
Insomnia	43.4%	1.33±1.7	3.05±1 .2 (506)
Breathing arrest	38.9%	1.15±1.7	2.96±1 .3 (453)
Gasping	25.1%	0.68±1.3	2.7211. 0(292)
Headaches	15.1%	0.30±0.8	1.97±0.9(176)
Erectile disease	6.0%	0.06±0.4	1.06±0.2(70)
Memory	2.3%	0.02±0.2	1 .27±0.6 (20)
Nausea+Vomiting	2.2%	0.03±0.3	1.7311.1 (26)
Other	8.5%	0.0310.7	2.0911.2(99)

According to “without 0” range order score and to the median of 4, it could be summarized that, in a population suspected from SAS, referred to a sleep center, there are four complaints places according to their average score: Snoring, with a mean score of about 4; Insomnia, breathing arrest or gasping, with a mean score of about 3; Headaches, nausea and vomiting or other, with a mean score of about 2 Memory troubles and erectile dysfunctions, with a score about 1 or less. There was a significant correlation between the total number of complaints the AHI and oxygen desaturation (Fig.1). More severe the SRBD, more complaints.

Figure 2

Fig. 1. The apnea-hypopnea index (AHI) (bars) and minimal oxygen desaturation (line) detected during polysomnographycal recording, according to the number of complaints.



The analysis of the complaints rank order score according to the SAS type and severity revealed that: the snoring, breathing arrest score and number of complaints were

significantly higher in patients with confirmed SAS than in those without; the number of complaints, breathing arrest, EDS and insomnia were significantly higher in severe forms of SAS and headache, erectile dysfunctions and nausea+vomiting were significantly greater in central than in obstructive SAS (Table 2).

Figure 3

Table 2. The p value of the means complaints scores comparison according to the presence of SAS, SAS intensity and type.

Complaints	SAS*	SAS type**	SAS intensity***
Snoring	<0.04	ns (0.96)	ns (0.29)
Breathing arrest	<0.001	ns (0.59)	<0.001
No of complaints	<0.05	Ns (0.28)	<0.02
Insomnia	ns (0.21)	ns (0.69)	<0.05
EDS	ns (0.66)	Ns (0.22)	<0.05
Headache	ns (0.73)	<0.04	ns (0.90)
Erectile dysfunctions.	ns (0.60)	<0.05	ns (0.97)
Nausea+Vomiting	ns (0.30)	<0.004	ns (0.60)
Gasping	ns (0.52)	ns(0.61)	ns (0.87)
Fatigue	ns (0.24)	Ns (0.95)	ns (0.62)
Memory troubles	ns (0.57)	Ns (0.42)	ns (0.51)
Others	ns (0.84)	Ns (0.54)	ns(0.21)DQ

*Comparison performed between SAS and non-SAS patients
**Comparison performed between obstructive, central and mixed SAS
** Comparison performed between mild, moderate and severe SAS

DISCUSSION

The role of the complaints as predictor of SRBD is well known and largely analyzes. Our approach was to offer predictive information on SRBD, using a rank order evaluation in a large highly significant number of subjects referred to a sleep center. The incidence of SAS we found in a population of snorers was of 58.6%. This is very close to that reported by other studies (52%) {[10]). There was a good concordance between the complaint frequency and its rank. More frequent complaints occupy closer places to the beginning, while less frequent, to the end of list. Snoring was by far the most frequent and had the highest rank order score (was the first reported complaint in the large majority of patients).

Our observed incidence of snoring of 96.3% is higher than 59.1% recently reported in a general population ([8]). This is a consequence of the fact that we analyzed a “pre-selected” population, which was sent to our sleep center because of loud snoring. The single exception was insomnia. In our analysis, insomnia had a higher score than expected according its frequency. This fact suggest that, from subjectively point of view, in a population suspected of SAS, complaint of insomnia is more important or more disturbing than other complaints. The significant correlation between the total number of complaints and the AHI and oxygen desaturation, we have found, prove that the patients suffering from more severe SAS have more complaints. According to the average scores we detected four complaints places intensity. Snoring occupies the first, fatigue, EDS, insomnia, breathing arrest or gasping the second; headaches, nausea and vomiting or other the third, and the memory troubles and erectile dysfunctions the fourth. Snoring, breathing arrest and number of complaints were found to be a good predictor for SAS, and the number of complaints, breathing arrest, EDS and insomnia for severe forms of SAS. Headache, erectile dysfunctions and nausea/vomiting were good predictors for CSAS.

It is considered that loud snoring, interrupted breathing during sleep, EDS, alteration of personality, headache in the morning, non-refreshing sleep and nocturnal choking sensations are signs predicting obstructive SAS ([1]), but that symptoms and clinical characteristics are not capable of identifying persons with increased apnea activity ([6,7]). Our analysis not completely confirms this assumption. We assume that, among all the complaints described in SAS, some design SAS, some SAS type, while other SAS intensity. For example snoring cannot be considered as specific for obstructive SAS but only for SAS, because frequently is also described in central form of SAS. Daytime sleepiness and insomnia must be considered only as predicting the SAS severity, because frequently are described in other sleep-related diseases. In our population suspected of SAS we found that patients confirmed as suffering from SAS, more frequently, put the snoring complaint on the first places, and this accordingly the SAS type or intensity. Additionally, more than 75% of patients with central SAS complained of snoring and the mean score of snoring did not significantly differ between OSAS and CSAS. For central SAS we observed other predictors such as headache, erectile dysfunctions, and nausea+vomiting.

This is in contradiction with some data assuming that in a SAS suspected population, those confirmed as suffering from CSAS presented with chief complaints of EDS or insomnia ([2]). Pure CSAS is rare, and it is caused by a heterogeneous group of disorders of central nervous system characterized by intermittent loss of respiratory drive during sleep ([3]). We also have found that only 4.2% from all SAS patients had CSAS. All the three complaints we found as predicting CSAS, are signs of central nervous system diseases. In contrast, we have found that both insomnia and

EDS scores were higher in more severe forms of SAS, but did not differ between SAS and non-SAS or between OSAS-MSAS-CSAS patients. This confirms the association between insomnia and EDS ([1]), the frequent night awakenings being the main cause of the daytime sleepiness. Daytime sleepiness was shown to be not secondary to hypoxemia at night but rather to poor quality of sleep and that is associated with heavy snoring even without appreciable deterioration of oxygen saturation ([7]). In a questionnaire investigated population, EDS was also reported be high in simply snorers not affected by SAS, suggesting that causes of self-reported EDS other than SRBD may be common ([9]). These indirectly confirm our observation. On the other hand, our data may be explained by the fact that they are not characteristic for SAS, they being also associated with other diseases.

CONCLUSIONS

In conclusion, our study shows that an analysis of the complaints rank order performed in a population suspected of SAS and referred to a sleep center, may give more utile predictive information about the SAS type and intensity than a simply analysis of the complaints type themselves. Our study cannot answer to the question: "What determines the order of the complaints in the complaint list? We started to the presumption that the list is exactly the same with that orally presented by the patient and that the patient selected his complaints in order of their gravity, the most disturbing being the first. However, is possible as other factors to be involved. We take the list from the patient file. There is possible as in the file, the order to be "pre-selected" by the physician from the patient complaints according to his own representation or conception about the complaints importance for the suspected disease.

Additionally, is also possible as the patient to describe his signs not in order of their gravity but randomly. Additionally, the patient sex, age, personal experience or cultural level may also have some influence. We found for example that female have a tendency to describe more complaints (average 3.84 in female vs. 3.67 in male) and to give more importance to some complaints {insomnia for example) than to another. Inversely, male complained of sexual dysfunction (all the sexual dysfunctions were noted only in male). In an ideal form of rank order study of complaints, the patient must select the complaint from a list in which every complaint has the same chance to be selected. Next studies had to clarify these.

CORRESPONDENCE TO

Dr.Goldstein Richard Zalman Aran Street 1/6 Lod Israel Tel: 972-8-9201384 E-Mail address: rishardg@mail.inter.net.il

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Author Information

R. Goldstein
Department of Lung Diseases and Allergy, Assaf Harofeh Medical Center

I. Shpirer
Department of Lung Diseases and Allergy, Assaf Harofeh Medical Center

D. Stav
Department of Lung Diseases and Allergy, Assaf Harofeh Medical Center

J.J.M. Askenasy
Sackler Medical School, University of Tel Aviv