Prevalence of Snoring and Obstructive Sleep Apnea Syndrome among Nurses and Resident Doctors Working in a University Hospital

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INTRODUCTION

Obstructive Sleep Apnea Syndrome (OSAS) is characterised by the episodes of complete or partial upper respiratory airway obstruction recurring during sleep and often a reduction in blood oxygen saturation (1). The gold standard diagnostic method for this syndrome is polysomnography (PSG).

Although PSG is the final diagnostic method for OSAS, most OSAS prevalence studies have been conducted based on symptoms rather than PSG results. However, there are some studies in which symptoms and PSG test results have been evaluated together in order to estimate the prevalence of OSAS. In a widespread prevalence study in which the criteria for the diagnosis of OSAS were the presence of excessive daytime sleepiness (EDS) and apnea-hypopnea index (AHI) of ≥5, the frequency of OSAS was found to be 4% in males and 2% in females (2).

Sleep disorders are more common among people working shifts with irregular sleep patterns. When insufficient sleep coexists with shift work, an increased tendency to sleep poses a more serious problem (3). An excessive tendency to sleep during work is observed 2-5 times more often in shift workers than in daytime workers. Irregular sleep patterns of shift workers and the associated infirmity and excessive tendency to sleep in the daytime can cause serious job accidents. Neurocognitive functions...
such as attention, concentration ability and memory are considerably deteriorated in OSAS (4).

For health staff, the great majority of whom work shifts, data related to the prevalence of OSAS are insufficient. A few studies about OSAS in health staff are based on data obtained from questionnaires.

In this study, it was aimed to investigate the prevalence of snoring and OSAS among nurses and the resident doctors, most of whom worked shifts in our hospital.

METHODS

The face-to-face interview method was performed with nurses and resident doctors working in a university hospital and who agreed to participate in the study. In total, 257 health staff completed a questionnaire modified according to the Berlin Questionnaire and Pittsburgh Sleep Quality Index (PSQI) (5, 6). This questionnaire included 76 items questioning the participants’ sleep duration, sleep patterns, sleep quality, habitual sleep efficiency, symptoms related to sleep disorders (snoring, witnessed apnea, EDS, dyspnea at sleep, personality and behaviour disorders, anxiety and depression, job accident, leg restlessness) and the features and severity of these symptoms, additional diseases, habits, socio-demographic features, working in shifts and shifting rules. The Epworth Sleepiness Scale (ESS) was used to reveal excessive daytime sleepiness. Moreover, the age, gender, body mass index (BMI) and branches of the health staff participating in the questionnaire were recorded (7).

After evaluation of the questionnaires, PSG examination was recommended to the participants who had concurrent apnea and/or EDS with snoring. Of the 20 participants who were recommended to undergo polysomnography, 16 accepted a PSG examination.

All-night PSG examination was performed with a 55-channel Alice 5 computed system (Respironics; Philips, Illinois, USA). The channels used in the study were: 6 channels electroencephalography (EEG), 2 channels electrooculogram (EOG), 1 channel nasal pressure sensor, 1 channel thermistor, 1 channel microphone, 1 channel chest effort, 1 channel abdominal effort, 2 channels foot electromyography (EMG), 1 channel pulse oximeter sensor, 2 channels chin EMG, 4 channels electrocardiography (EKG) and 1 channel body position. Chest and abdominal efforts were measured with the elastometric plethysmography method. Polysomnography scoring and OSAS definition were performed according to the “American Academy of Sleep Medicine” criteria (8). Apnea was defined as a 90% or greater reduction in the airflow measured with thermistor lasting for at least 10 seconds. Moreover, another essential condition for the definition of apnea was meeting the amplitude criterion for 90% or more of the time. Two different criteria were used for hypopnea and the presence of any of these criteria was considered hypopnea. The first criterion was defined by the presence of a 30% or greater decrease from the basal, which lasted for at least 10 seconds, in the nasal pressure signal together with 4% or greater desaturation. The second criterion was defined by the presence of a 50% or greater decrease from the basal, which lasted for at least 10 seconds, in the nasal pressure signal together with 3% or greater desaturation. Moreover, in both criteria defined for the diagnosis of hypopnea, another requirement was to meet the amplitude criterion 90% of the time or more. The total number of apnea and hypopnea episodes per hour was defined according to the Apnea Hypopnea Index (AHI).

Working in shifts was defined as working for 16 hours from 04:00 p.m. to 08:00 a.m. or for 24 hours from 08:00 a.m. to 08:00 a.m. on the following day.

All of the participants were given detailed information about the study and written informed consent forms were obtained from them. The study protocol was approved by the ethics committee of the university in the meeting numbered 2012/20 on October 16, 2012.

Statistical Analyses

Statistical analysis was performed using SPSS 18.0 for Windows (Statistical Package for the Social Sciences). Descriptive statistics were expressed as mean±standard deviation or median (minimum-maximum) for numeric variables and as number and percentage for categorical variables. Chi-square and Fisher’s Exact Chi-square tests were employed for comparing two groups in terms of categorical variables. Also, the Mann-Whitney U test was used to compare two groups for numerical variables. The value of p<0.05 was considered significant.

RESULTS

Two hundred and fifty seven participants were included in the study. Of the participants, 63% were nurses and 37% were resident doctors. The mean age of the cases was 28.8±3.7 (19-39) years, the mean body mass index was 24.03±3.85 kg/m², and 34.2% of them were male (Table 1).

Four (1.6%) of the 20 participants who were proposed to undergo PSG refused examination, so only 16 cases (6.2%) underwent PSG. According to PSG results, the prevalence of OSAS in the cases participated in the study was 4.7% (12/257). The mean AHI was found to be 8.07±4.54 for the 12 patients diagnosed with obstructive sleep apnea syndrome. One patient (AHI=22) was found to have moderate and the other 11 patients mild OSAS. In comparison of the participants with and without OSAS, the values of BMI were significantly higher in the cases with OSAS.

Of the cases, 28.8% (n=74) had snoring, 2.7% (n=7) had witnessed apnea (Table 2), and 7.8% (n=20) had EDS (ESS≥11). OSAS was detected through PSG in only 3 of 20 participants with EDS (15%). Eleven of the 17 patients with an ESS value of ≥11 and without OSAS

<table>
<thead>
<tr>
<th>Table 1. Demographic features of the patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age- year (interval)</td>
</tr>
<tr>
<td>Body mass index- kg/m²</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male- n (%)</td>
</tr>
<tr>
<td>Female- n (%)</td>
</tr>
<tr>
<td>Occupation</td>
</tr>
<tr>
<td>Doctor- n (%)</td>
</tr>
<tr>
<td>Nurse- n (%)</td>
</tr>
<tr>
<td>Smoking</td>
</tr>
<tr>
<td>Never smoked- n (%)</td>
</tr>
<tr>
<td>Active smoker- n (%)</td>
</tr>
<tr>
<td>Smoked but quitted- n (%)</td>
</tr>
</tbody>
</table>
were working in shifts. The coexistence of snoring, witnessed apnea
and EDS was found in 1.5% of the cases (n=4). ESS values of the par-
ticipants are shown in Table 3. No case with suspected upper airway
resistance syndrome and narcolepsy was observed.

Among the participants, the mean of monthly night shifts was
7.6±3.8. Two hundred and fifteen (83.7%) of the cases worked shifts.
The prevalence of OSAS in shift workers was 5.1%. Of the cases with
obstructive sleep apnea syndrome, 91.7% (11/12) were working
shifts, but 83.3% (204/245) of those without OSAS were working in
shifts (p=0.697). All cases diagnosed with OSAS were male while 31%
of the cases without OSAS were male (p<0.001). BMI values of the
participants with OSAS (31.37±4.75 kg/m²) were found to be high-
ner than those of the participants without OSAS (23.67±3.42 kg/m²)
(p<0.001) (Table 4).

DISCUSSION
In our study, the prevalence of OSAS was found to be 4.7% among
health staff and 5.1% among those health staff working shifts. The
prevalence of OSAS in shift workers was 5.1%. Of the cases with
obstructive sleep apnea syndrome, 91.7% (11/12) were working
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In our study, the prevalence of OSAS for health staff working shifts
was 5.1%. This ratio is close to the prevalence of OSAS for the whole
population but lower than the prevalence of OSAS among many

### Table 2. Distribution of the symptoms related to sleep disorders

<table>
<thead>
<tr>
<th>Symptom</th>
<th>NO</th>
<th>Rarely</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snoring- n (%)</td>
<td>189 (71.2)</td>
<td>52 (20.2)</td>
<td>17 (6.6)</td>
<td>5 (1.9)</td>
</tr>
<tr>
<td>Witnessed apnea- n (%)</td>
<td>250 (97.3)</td>
<td>5 (1.9)</td>
<td>1 (0.4)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Waking up with dyspnea and choking sensation - n (%)</td>
<td>249 (96.9)</td>
<td>7 (2.7)</td>
<td>0</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Waking up tired in the morning- n (%)</td>
<td>32 (12.5)</td>
<td>116 (45.1)</td>
<td>77 (30.0)</td>
<td>32 (12.5)</td>
</tr>
<tr>
<td>Daytime sleepiness in spite of sufficient sleep at night-n (%)</td>
<td>93 (36.2)</td>
<td>114 (44.4)</td>
<td>43 (16.7)</td>
<td>7 (2.7)</td>
</tr>
<tr>
<td>Sleepiness at work in spite of sufficient sleep at night-n (%)</td>
<td>88 (34.2)</td>
<td>123 (47.9)</td>
<td>40 (15.6)</td>
<td>6 (2.3)</td>
</tr>
<tr>
<td>Dysmnesia- n (%)</td>
<td>76 (29.6)</td>
<td>107 (41.6)</td>
<td>59 (23.0)</td>
<td>15 (5.8)</td>
</tr>
<tr>
<td>Excessive sleepiness after shift changes - n (%)</td>
<td>69 (26.8)</td>
<td>85 (33.1)</td>
<td>86 (33.5)</td>
<td>17 (6.6)</td>
</tr>
</tbody>
</table>

### Table 3. Epworth sleepiness scale analysis for the individuals involved in the study

<table>
<thead>
<tr>
<th>Activity</th>
<th>I never feel sleepy</th>
<th>I rarely feel sleepy</th>
<th>I often feel sleepy</th>
<th>I always feel sleepy</th>
</tr>
</thead>
<tbody>
<tr>
<td>While reading newspaper- n (%)</td>
<td>90 (35.1)</td>
<td>124 (48.2)</td>
<td>37 (14.4)</td>
<td>6 (2.3)</td>
</tr>
<tr>
<td>While watching TV- n (%)</td>
<td>72 (28.0)</td>
<td>128 (49.8)</td>
<td>47 (18.3)</td>
<td>10 (3.9)</td>
</tr>
<tr>
<td>While sitting- n (%)</td>
<td>168 (65.4)</td>
<td>65 (25.3)</td>
<td>19 (7.4)</td>
<td>5 (1.9)</td>
</tr>
<tr>
<td>While traveling- n (%)</td>
<td>88 (34.2)</td>
<td>96 (37.4)</td>
<td>51 (19.8)</td>
<td>22 (8.6)</td>
</tr>
<tr>
<td>In the afternoon- n (%)</td>
<td>85 (33.1)</td>
<td>109 (42.4)</td>
<td>45 (17.5)</td>
<td>18 (7.0)</td>
</tr>
<tr>
<td>While speaking- n (%)</td>
<td>235 (91.4)</td>
<td>21 (8.2)</td>
<td>1 (0.49)</td>
<td>0</td>
</tr>
<tr>
<td>After meals- n (%)</td>
<td>149 (58.0)</td>
<td>80 (31.1)</td>
<td>27 (10.5)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>While waiting in traffic- n (%)</td>
<td>239 (93.0)</td>
<td>16 (6.2)</td>
<td>1 (0.4)</td>
<td>1 (0.4)</td>
</tr>
</tbody>
</table>

The studies conducted with individuals working in shifts have found
rates of OSAS to be different from each other. This difference is
thought to be caused by variations in risk factors such as age, gender
and BMI. In individuals with irregular sleep patterns and decreased
daytime adaptation, an increase is seen in daytime sleepiness and in
concentration loss. Garbarino et al. (10) found that the rate of sleep
disorders was 35.7% for police officers working in shifts and 26.3%
for those only working during the daytime. Furthermore, EDS was
detected in bus drivers working shifts (11). In a study conducted by
Akkoyunlu et al. (12) in our clinic, the all-night PSG test was performed
for 241 long-distance drivers and the prevalence of OSAS was found
to be 14.1%. In another study involving 410 long-distance bus drivers
in Hong Kong, 17 people were selected from each shift and were ex-
posed to PSG. According to the polysomnography results, 31 (7.5%)
individuals with the value of AHİ ≥5 were diagnosed with OSAS (13).
A similar study conducted in Spain revealed the prevalence of OSAS to
be 8.6% for 163 long-distance transport drivers (14).
groups working in shifts. The fact that the health workers in our study were younger than those in other occupational groups working shifts may explain the reason for the lower OSAS ratios to a certain degree.

Doğan et al. (15) conducted a survey study with 1202 health staff consisting of physicians, nurses, technicians and lab workers in Sivas and found the rate of snoring to be 22%, the rate of witnessed apnea to be 4.4% and the rate of EDS to be 28.1%. All three of these symptoms were present in 1.8% of participants. The presence of snoring, witnessed apnea and three symptoms together in our study was similar to that in the study conducted in Sivas. The rate of EDS in the study in Sivas was found to be quite high compared to our study. However, the ESS value defined as EDS was not stated in that study. In a study performed in another health centre, Sönmez et al. (16) reported the prevalence of snoring to be 35.9%, the prevalence of habitual snoring to be 5.4% and the prevalence of EDS to be 15.4% for nurses working in shifts. Similar results were also obtained in our study.

The Epworth Sleepiness Scale is a subjective measure evaluating sleepiness. There are many causes of hypersomnia, but the most common is sleep breathing disorders. In a study conducted on taxi drivers, the frequency of individuals with an ESS score over 10 was found to be 23.7%. Also, the frequency of accident risk for those with EDS was reported to be 67.8% in the same study (17). In our study, 17 of the 20 individuals with the value of EUS≥11 did not have OSAS. It was thought that higher ESS values could be explained by shift working since 11 of these 17 individuals also worked at night. Many diseases and conditions (inadequate sleep, drugs, depression, comorbid diseases, psychiatric conditions, other sleep disorders except OSAS) besides obstructive sleep apnea syndrome can lead to EDS (18). We suggest that high ESS values of 6 individuals working daytime might be the result of another condition rather than OSAS.

A relationship was demonstrated between EDS and job accidents. Suzuki et al. (19) found the rate of daytime sleepiness to be 26% for nurses working shifts. They suggested that the number of job accidents (malpractice of drugs, selection of wrong surgical instruments or needle stick injury) increased significantly among nurses with daytime sleepiness.

In previous studies, whether obesity increases the tendency to OSAS has been explored. It was reported that the OSAS risk increased 8-12 times in individuals with BMI>29 and was higher in individuals with upper-body obesity and in the morbidly obese patients with BMI>40 (25). In our study, when the individuals with OSAS were compared to those without, it was found that BMI values were significantly higher for participants with OSAS. In a study of BMI conducted with young adults in our country, the mean BMI was found to be 22.4±3.03 in males and 20.76±2.54 in females (26). Considering age, the mean values for BMI in our study were similar to those in general society.

The prevalence of OSAS was reported to be lower among females and the young population (27, 28). In our study, it is believed that the higher number of female participants and the fact that the study population consisted of young people might have contributed to the lower than expected prevalence of OSAS. Another reason for the lower prevalence of OSAS in shift workers than in society as a whole might be that the individuals working actively at these roles have the potential to be healthier.

Our study has some limitations, although it is important for demonstrating the prevalence of OSAS through PSG among health staff. Those health staff working in shifts and working daytime could not be compared because there were fewer individuals working in the daytime. Moreover, the health staff involved in our study were very young (28.78±3.74 years), which might pose a problem for comparison of the data obtained by other studies conducted with other shift working populations with our data. We suggest that the results of the all-night PSG test performed for some selected specific individuals, rather than all individuals in the study group or those individuals with at least one of three major symptoms, show the prevalence of OSAS to be lower than it actually is.

CONCLUSION
Consequently, OSAS is an important health issue for health staff, a great majority of whom work in shifts. In cases with obstructive sleep...
apnea syndrome, EDS and attention deficit are detected. Therefore, the symptoms related to sleep disorders should be questioned in shift workers and the necessary examinations and treatments should be performed for those with sleep disorders. Moreover, the individuals with OSAS should be charged with duties requiring less attention.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Bülent Ecevit University Ethical Committee of Clinical Trials.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.


Conflict of Interest: No conflict of interest was declared by the authors.

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REFERENCES