Obstructive Sleep Apnea: Comparison of Syndrome Severity and Risk Factors for Adult Jewish and Arab Males in Northern Israel

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ABSTRACT: **Background:** Obstructive sleep apnea (OSA) is a common health problem with an estimated prevalence of 4% among men, many of whom are undiagnosed and untreated.

Objectives: To compare demographic characteristics, health profiles, risk factors, and disease severity in Arab and Jewish men with OSA syndrome.

Methods: In this cross-sectional study we retrospectively analyzed clinical data from the medical files of men ≥ 22 years old who were referred to the Rambam Medical Center sleep clinic during the period 2001–2009 with a suspected diagnosis of OSA. OSA severity was measured using the apnea-hypopnea index (AHI). Categorical variables were compared using the chi-square test. Relations between OSA severity and a set of independent risk factors were assessed by linear regression analysis.

Results: A total of 207 men were included (39 Arabs, 19%; 168 Jews, 81%). Arab participants were younger than their Jewish counterparts (45.5 ± 8.9 years vs. 49.8 ± 11.8, $P = 0.04$) and their body mass index (BMI) was higher (33.1 ± 5.1 vs. 30.0 ± 4.4, $P = 0.001$). OSA severity (AHI score) was higher among Arab men, with low, medium and high severity scores seen in 10%, 33% and 56% of Arab men vs. 35%, 29% and 37% of Jewish men, respectively [T(198)=2.39, $P = 0.02$]. Mean blood oxygen saturation was comparable.

Conclusions: Arab men presenting for evaluation of sleep apnea harbored more severe OSA symptoms, were younger, and had higher BMI compared to Jewish men. Since OSA syndrome evolves for several years until it becomes severe, these findings suggest that Arab men seek medical assistance later than Jewish men with OSA.

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KEY WORDS: obstructive sleep apnea (OSA), body mass index (BMI), apnea/hypopnea index (AHI), Arabs, Jews

Obstructive sleep apnea (OSA) is a sleep-related breathing disorder characterized by recurrent upper airway obstruction, resulting in sleep breathing difficulties and impaired sleep quality. These disturbances lead to disrupted nighttime sleep, frequent arousal, and excessive daytime sleeping. OSA is common in the general adult population, affecting about 4% of adults in the United States [1]. Despite this high prevalence, it is often not diagnosed or is diagnosed only during late-stage disease [2].

The most prominent risk factor for OSA is obesity [3]. Several studies have highlighted the links between OSA and cardiovascular or metabolic diseases [4,5], quality-of-life, depression [6], and work and car accidents [7-9]. The adult Arab population in Israel has higher rates of obesity, cardiovascular mortality, and other risk factors for OSA compared with the Jewish population [10,11]. We aimed to determine whether OSA syndrome is detected at later stages among Arab men, and to compare the demographic and risk profiles of OSA patients in the two populations.

PATIENTS AND METHODS

The study group included consecutive male patients aged 22 and older living in northern Israel, who were referred to the sleep clinic at the Rambam Medical Center during 2001–2009 and whose clinical presentation was consistent with the OSA syndrome. Data for this retrospective cross-sectional study were collected from the personal files of each examinee in the sleep clinic. This file includes demographic data, weight, height, smoking habits, and data on relevant illnesses, including dyslipidemia, hypertension, diabetes mellitus, coronary artery disease, and others. Data regarding sleep apnea evaluation, including respiratory indices, were obtained from the home sleep-testing device (WatchPAT™, Itamar Ltd, Caesarea, Israel). OSA severity was ranked using the apnea-hypopnea index (AHI) of the American Academy of Sleep Medicine [12]. The AHI is an average that represents the combined number of apneas and hypopneas that occur per hour of sleep. There are three levels of OSA:

- mild OSA, where an AHI of 5–15 is characterized by involuntary sleepiness during activities but requires little attention
- moderate OSA, AHI 16–30, typified by involuntary sleepiness during activities that require some attention

- severe OSA, AHI >30 with involuntary sleepiness during activities such as driving, which requires more active treatment.

Obesity was scored using categories of body mass index (BMI) established by the 1997 World Health Organization (WHO) Obesity Meeting [13]. The work was approved by the ethics committee of the University of Haifa.

STATISTICAL ANALYSIS

Data were stored and analyzed using SPSS 19.0 for Windows. Data for normally distributed variables (age, BMI, AHI, and minimum oxygen saturation level) were analyzed using the parametric *t*-test; the chi-square test was used for categorical variables (smoking habits, comorbidities). A linear regression analysis was performed in order to ascertain the relationship between severity of sleep apnea (AHI, the dependent variable) and a set of independent risk factors, adjusted for all other variables.

RESULTS

A total of 207 men were included in the study: 168 Jews (81%) and 39 Arabs (19%). The Arab examinees were about 4 years younger than the Jewish examinees (45.5 ± 8.9 vs. 49.8 ± 11.8, $P = 0.04$ [Table 1]. The mean BMI of Arab subjects was significantly higher than that of the Jews (33.1 ± 5.1 vs. 30.0 ± 4.4, $P = 0.001$). Among Jewish participants, 8.9% had normal BMI (18.5–24.9), 46.4% were overweight (BMI 25.0–29.9) and 44.6% were obese (BMI ≥ 30); however, among Arab men only 5.3% had normal BMI, 31.6% were overweight, and 63.2% were obese.

AHI scores for OSA severity were significantly higher among Arab men [$t(198)=2.39$, $P = 0.02$]. Among Arabs in the study population, 56.4% were diagnosed with severe OSA syndrome, 33.3% with medium severity, and 10.3% with low severity. Among Jewish patients, 37.3% suffered from severe OSA syndrome, 29.1% from medium severity, and 34.8% were diagnosed with low severity OSA. There was no significant difference between the two ethnic groups with respect to the mean minimal blood O_2 saturation.

Table 2 provides a comparison between the two groups of examinees regarding certain comorbidities and smoking habits. Smoking was significantly more prevalent among Arab examinees as compared with Jewish examinees ($P < 0.001$). Similarly, the prevalences of dyslipidemia, ischemic heart disease (IHD) and obstructive lung disease were significantly higher among the Arab examinees than the Jewish examinees. There was no significant difference in the prevalence of hypertension between the two ethnic groups ($P = 0.87$).

Multiple linear regression analysis was conducted to assess potential relationships between AHI and several independent risk factors, including age, BMI, current smoking, hypertension, obstructive lung disease, IHD, and ethnicity. As BMI and dyslipidemia are not independent of one another, only BMI was included in the analysis. Because the variable AHI was not normally distributed, a log transformation was used in the regression model. Residual analysis of the model showed a good agreement with normal distribution and stability of the variance. The results of this analysis are shown in Table 3. Of

Table 1. Comparison of mean age, BMI, AHI events and minimal blood oxygen saturation of Arab and Jewish examinees

	Jewish ± SD	Arab ± SD	*t*	*P* value
Age (years)	49.8 ± 11.2	45.5 ± 8 .9	2.12	0.04*
BMI (kg/m^2)	30.0 ± 4.4	33.1 ± 5.1	2.94	0.001**
AHI (events/hr)	29.6 ± 22.8	39.4 ± 22.5	2.39	0.02*
Min blood O_2 Sat. (%)	80.8 ± 10.2	79.4 ± 10.2	t	0.43

SD = standard deviation, BMI = body mass index, AHI = apnea/hypopnea index; *t* = *t*-test for two independent samples

*$P < 0.05$

**$P < 0.01$

Table 2. Differences between the two study groups regarding smoking habits and the prevalence of comorbidities commonly linked to OSA

	Jewish men n=168	Arab men n=39	c^2	*P* value*
Smoking	43 (32%)	21 (68%)	13.9	0.001
Hypertension	57 (36%)	16 (43%)	0.7	0.40
Hyperlipidemia	25 (16%)	12 (33%)	5.73	0.02
Diabetes mellitus	14 (9%)	3 (8%)	0.03	0.87
Ischemic heart disease	15 (10%)	10 (29%)	8.78	0.03
Obstructive lung disease	13 (9%)	10 (30%)	10.6	0.01

*Chi-square test

Table 3. Standardized regression coefficients of the independent variables for predicting AHI*

Independent variables	Coefficient	*P* value
Ethnicity	0.0866	
Age	0.0540	
BMI	0.3470	0.001
Smoking	0.1197	
Diabetes mellitus	0.1177	
Ischemic heart disease	0.0559	
Obstructive lung disease	-0.0607	
Hypertension	-0.0425	
R^2	0.18	
F	3.9	0.001

*Due to missing values only 151 subjects were included in this analysis

the independent variables tested, only BMI showed a statistically significant association with AHI; however, when the correlation between BMI and AHI was conducted separately for Arabs and Jews, no significant correlation was found in Arab men ($r = 0.068$, $P > 0.05$) while for the Jewish men there was a significant positive correlation ($r = 0.036$, $P < 0.01$).

DISCUSSION

Arab men who were referred to the sleep clinic at the Rambam Medical Center constitute about 20% of the study group. This is in line with their proportion in the general Israeli population, although in northern Israel they represent a somewhat higher proportion.

There were several differences between the two ethnic groups of participants: Arab participants were on average 4.5 years younger than the Jewish men, had significantly higher BMI, had nearly twice the rate of smoking compared with Jewish participants, and their OSA was significantly more severe. Since the natural course of OSA evolves over several years, it seems that the delay in seeking medical care in the Arab population indicates lower awareness of OSA in this group. Nevertheless, these findings are not surprising given that in Israel the prevalence of metabolic syndromes and other cardiovascular risk factors is higher among Arabs compared with Jews [10]. Despite the younger age of Arab study participants, they presented more advanced stages of OSA syndrome compared to Jewish men in the study.

Similar observations were made in a previous study in Israel [11]. Our findings are also in agreement with those of the first National Health and Nutrition Survey conducted in Israel between 1999 and 2000 [14]. In that survey, the age-adjusted rates of reported hypertension were similar for Jewish and Arab men, 15.6% and 16.1%, respectively; however, hyperlipidemia was slightly higher among Arab men as compared to Jewish men, the standardized rate of smoking among Arab men was 42.4% versus 29.3% among Jews, and obesity (BMI ≥ 30) was 1.4 times higher among Arab men. While several previous studies demonstrated that obesity was the most important risk factor for OSA [15-17], other research did not find such a uniform relationship [18,19].

OSA is the most frequent cause of excessive daytime sleepiness (obstructive sleep apnea syndrome) and can seriously affect the judgment and abilities of affected individuals [20]. This may carry grave consequences when one considers the possible harmful effects of daytime sleepiness on work performance and accidents and is of particular importance in terms of commercial driving, travel accidents and work-related injuries [9,21-23]. As there is effective treatment for OSA as well as effective intervention to reduce the risk factors, early identification of the syndrome is hugely important for the affected individuals and has public health relevance since it reduces the risk of accidents. In addition, OSA has been shown to be associated with other health conditions such as impaired glucose metabolism [24,25].

CONCLUSIONS

Our findings indicate that, as a rule, Arab subjects suffering from obstructive sleep apnea are diagnosed at more advanced stages of their disease, and their syndrome is associated with a more severe level of comorbidities, including obesity, metabolic syndrome and ischemic heart disease. These characteristics attest to reduced awareness of the syndrome by both the individuals and health professionals in this community. Thus, early detection of OSA syndrome and awareness of related harmful health and functional effects mandates greater attention to this syndrome in obese persons, especially in the Arab population.

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Disclosures

Prof. Rafael Carel has no conflicts to disclose. During the period of the study Inna Brodsky was employed at the Sleep Clinic and was an employee of Itamar Medical Ltd. Dr. Giora Pillar was a consultant to Itamar Medical Ltd. The study was conceived and initiated by the authors, who retained control of data throughout the study and take full responsibility for the integrity of the analysis and conclusions.

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