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ORIGINAL ARTICLE

Symptoms of obstructive sleep apnea in a Caribbean sample

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Abstract Obstructive sleep apnea (OSA) is a prevalent sleep disorder that disproportionately affects blacks. While clinical and epidemiologic data indicate intraethnic differences in several medical diseases, little is known about whether OSA symptoms differ within the black ethnic group. We estimated the rate of OSA symptoms in a community-based sample of Caribbean-born black men and women. We also ascertained which sociodemographic and/or medical factors were associated with OSA risk. A total of 554 patients (mean age=48.17±16.75 years) participated in the study; 55% were women. Data were collected in four primary-care clinics in Brooklyn, NY. A health educator explained the purpose of the study to interested patients and assisted consenting participants in completing questionnaires, which required 15 min to complete. Participants reporting habitual snoring, excessive daytime sleepiness, and sleep fragmentation were considered at high OSA risk. The rate of OSA symptoms was: snoring (45%), excessive daytime sleepiness (33%), and difficulty maintaining sleep (34%). Many reported falling asleep while watching television (47%) or while driving (14%). Based on logistic regression analysis, a history of heart disease was the most important predictor of the likelihood of expressing OSA symptoms, with a corresponding multivariate-adjusted odds ratio of 11 (95% confidence interval=3.03–40.63). Findings suggest the need to investigate whether Caribbean-born blacks are at greater risk for developing OSA than African Americans and whites. Caribbean-born blacks with a history of heart disease should be a prime target for interventions that promote adequate screening and timely OSA diagnosis.

Keywords Sleep apnea · Snoring · Sleepiness · Ethnicity · Caribbean

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Introduction

Obstructive sleep apnea (OSA) is a prevalent sleep disorder characterized by recurrent apnea and hypopnea episodes resulting from partial or complete closure of the upper airway during sleep [1]. Resulting breathing pauses lead to intermittent nighttime hypoxemia, which in turn causes recurrent cortical arousals associated with sleep fragmentation, loud

snoring [2], and hemodynamic changes [3, 4]. Consequences of untreated OSA include altered sleep architecture [5], cognitive deficits and poor performance [6], excessive daytime sleepiness, and fatigue [7]. Furthermore, OSA has been linked to cardiovascular morbidity [8–11], automobile accidents [12, 13], and excess mortality [9, 14].

Results of an important epidemiological study conducted in 1993 indicated that 2% of middle-aged women and 4% of middle aged men met the diagnostic criteria for OSA [15]. Investigators concluded that 9% of women and 24% of men have an apnea–hypopnea index (AHI) greater than or equal to 5 and thus are at an increased risk for OSA. More recent studies suggest that the number of American adults at risk for OSA is increasing. According to the 2005 National Sleep Foundation survey, 26% of US adults (men=31% and women=21%) are at high risk for OSA [16]. Despite the alarming increase in OSA estimates, only 10% of the US population has received adequate screening. It is estimated that 82% of men and 93% of women with moderate to severe sleep apnea remain undiagnosed [17].

It remains unclear whether available prevalence estimates are applicable to each ethnic group comprising the US population. In the last decade, some effort has been made to study differences in the prevalence and severity of OSA among blacks and whites. Evidence shows that the incidence, prevalence, and severity of OSA are strikingly higher among blacks relative to whites [16–21]. A home sleep study performed among community-dwelling adults (age ≥65) showed that blacks were 2.5 times more likely to have an AHI of 30 or higher compared to whites [18]. Ethnic disparities in OSA estimates might even be greater if one considered a respiratory disturbance index greater than 10. In effect, in a study comparing 225 black and 622 white volunteers, aged 2–86 years, 31% of blacks versus 10% of whites had OSA [22]. Another worthy observation in that study is that young blacks (≤25 years) may be at a greater risk for OSA than their young white counterparts. Some have argued that there may be a genetic basis for OSA pointing to data suggesting a segregation in the codominant pattern of inheritance among blacks, with an allele frequency of 0.14 explaining 35% of the variance in OSA severity [23].

Data addressing intraethnic health disparities in sleep is scant, although available clinical and epidemiologic data indicate that intraethnic differences exist in several physical health measures [24–29]. For example, US-born blacks (African Americans) have a higher mortality rate than Caribbean-born blacks (Caribbean-born blacks) [30]. Using 1990 US Census data for New York City, African Americans ages 25 to 44 years had a death rate from coronary heart disease that was four times the rate for Caribbean Americans of the same sex and age [30]. This is consistent with a report from the NYC Department of Health and Mental Hygiene, indicating that Caribbean Americans are less likely to have medical illnesses upon migration to the USA, although risks tended to be similar after integration in mainstream society, usually occurring after 4 years of residence [31]. Regarding the sleep profile itself, a recent study conducted in Brooklyn, NY, showed that Caribbean Americans reported fewer insomnia complaints relative to African Americans (41.8% vs. 49.2%, respectively) [28]; the influence of duration of residence in New York on sleep could not be established in that study.

The evidence presented above suggests that African Americans are characteristically different from whites in regard to OSA prevalence and severity, but no comparative data exist for Caribbean Americans. Consistent with the increase in the Caribbean population in New York, there has been a growing interest to study the risk profile for diseases among men and women in that ethnic group. In the present study, we estimated the rate of OSA symptoms in a community-based sample of Caribbean men and women residing in Brooklyn, NY. We also ascertained whether those symptoms were associated with medical morbidity and sociodemographic factors.

Materials and methods

A total of 554 patients were recruited for the study. Their average age was 48.17±16.75 years, range=20–90 years. Of the sample, 55% were women and 45% were men. This study was conducted in four primary-care clinics in Central Brooklyn, serving primarily individuals born in the Caribbean. For data collection purposes, all patients who were 18 years old or older were eligible to participate. Eligible patients were approached by a health educator who explained the purpose of the study and obtained informed consent using procedures approved by the Institutional Review Board at Kingsbrook Jewish Medical Center. The health educator assisted all participants in completing questionnaires.

Questionnaires were available in both English and Haitian Creole, requiring approximately 15 minutes to complete. They included basic demographic questions as well as self-rated items on health status, sleep apnea symptoms, insomnia, and mood. Participants reporting habitual snoring, excessive daytime sleepiness, and sleep fragmentation were considered at high risk for sleep apnea. Physicians were encouraged to refer patients with positive screening results to see a sleep specialist.

Statistical analysis

All data were first entered in an Excel spreadsheet and were later converted into SPSS 15.0 for statistical analysis. The present analysis examined OSA symptoms and assessed associations of those factors with medical morbidity and

sociodemographic variables. Frequency and measures of central tendency were used to describe the sample.

In preliminary analyses, Pearson and Spearman correlations were used to explore relationships between variables of interest. Fisher's exact test was employed to assess differences in insomnia-related complaints comparing respondents at a high risk for OSA and those at low risk. The OSA risk factor classified individuals into two groups: those who reported snoring, excessive daytime sleepiness, and sleep fragmentation vs. those who did not. Relationships of OSA risk to medical factors and sociodemographic variables were examined with multiple logistic regression analysis. As indicated in Table 2, ten factors were entered in the final regression model. Factors were selected based on their theoretical importance; all correlated with the dependent measure (OSA risk) in preliminary analyses. Medical comorbidities were adjusted in the model.

Results

The rate of OSA symptoms in this sample was: snoring (45%), witnessed apneas (36%), and excessive daytime sleepiness (33%). Many of the respondents indicated falling asleep while watching television (47%) or while driving (14%). Overall, 34% reported difficulty initiating sleep, 34% difficulty maintaining sleep, and 44% early morning awakening; 35% indicated daytime napping and 11% used sleep medicine.

Of the sample, 35% reported a history of hypertension and 16% a history of heart problems. Thirty-four percent reported difficulty concentrating during the day. Sixty-four percent rated their health status as good to excellent and 36% as fair to poor; 34% were satisfied with their habitual sleep. The average body mass index (BMI) of the patient was 29.15 ± 7.16 kg/m^2.

Using Fisher's exact test, we found significantly greater rates of difficulty initiating sleep, early morning awakening, and daytime napping among respondents at high OSA risk (see Table 1). Based on logistic regression analysis, a history of heart disease was the most important predictor of the likelihood of reporting OSA symptoms. The corresponding multivariate-adjusted odds ratio was 11 (95% confidence interval=3.034–40.625). Other factors showing significant relationships with OSA risk were a history of hypertension, sleep satisfaction, ability to concentrate during the day, and falling asleep while watching television (see Table 2).

Table 1 Differences in insomnia-related complaints between respondents at high OSA risk and respondents at low OSA risk

Variable	OSA risk (low), %	OSA risk (high), %	χ^2
Difficulty initiating sleep	32	49	8*
Early morning awakening	41	66	15**
Daytime napping	32	54	12**
Sleep medicine	10	13	1

Differences in insomnia-related complaints were assessed using Fisher's exact tests.
*$p<0.01$, **$p<0.001$

Discussion

The recognition that health disparities exist has given the impetus for a number of studies investigating physical health characteristics in underserved minority communities. Epidemiologic and clinical studies have shown that generally blacks are characterized by more severe sleep apnea compared with their white counterparts [18, 32-35]. Our study is the first to examine symptoms of OSA among Caribbean men and women residing in Brooklyn, NY. The main finding of the study is that a significant number of Caribbean Americans reported OSA symptoms (i.e., snoring and excessive daytime sleepiness) and that a history of heart disease is a strong predictor of the likelihood of reporting these symptoms.

The estimate of habitual snoring, the typical symptom of OSA, in our sample (45%) was greater than estimates derived from the general US population or from other ethnic groups, including African Americans. According to the National Sleep Foundation, 32% of American adults (≥18 years) snore habitually [36]. This is consistent with data from the Cardiovascular Health Study, showing that 33% of respondents were habitual snorers [37]. Prevalence data specific to US-born blacks (African Americans) do not exist, but available clinical data suggest that snoring rates for blacks as a whole (29%) are greater than observed for whites (18%) [32, 33]. It is difficult to estimate how many respondents in the aforementioned studies might have been Caribbean-born blacks, since most published reports use aggregate ethnic groupings, precluding an assessment of intragroup differences. It may be that snoring rates for Caribbean-born blacks, as noted in our study, are in fact greater than observed among African Americans.

These findings are in line with previous reports suggesting that snoring is observable across cultures and countries, although its prevalence seems to vary on the basis of which country or culture is under investigation. Among French and British people for instance, snoring rates for middle-age adults were 35% and 40%, respectively [38, 39]. Snoring rates may be much lower among adults from Sweden (15%) [40] and from Singapore (6.8%) [41]; it was interesting to note ethnic differences comparing Chinese (6.2%), Malay

Table 2 Associations of demographic, medical, and daytime functioning factors to OSA risk

Variable	OR	CI
Age	0.76	0.94–1.02
Sex	2.36	0.80–6.35
BMI	0.51	0.96–1.09
History of heart disease	11.22**	2.52–34.34
History of hypertension	4.03*	0.08–0.97
Health satisfaction	1.18	0.40–1.30
Sleep satisfaction	3.95*	1.01–8.55
Ability to concentrate	3.67*	0.97–8.76
Sleepy while driving	0.73	0.10–2.41
Fall asleep watching television	5.42*	1.22–10.21

Adjusted odds ratios (OR) and confidence intervals (CI) were derived from regression of the OSA risk factor on demographic, medical factors, and daytime functioning. The OSA risk factor classified individuals into two groups: those who reported snoring, excessive daytime sleepiness, and sleep fragmentation vs. those who did not.
*$p<0.05$, **$p<0.01$

(8.1%), and Indian respondents (10.9%). It seems reasonable to conclude that snoring rates among Caribbean American men and women might be greater than rates found for other ethnic groups, but definitive conclusions await population-based studies.

Excessive daytime sleepiness, another symptom highly suggestive of greater OSA risk, tended to be more common in our sample as well. Specifically, 33% of the participants reported excessive daytime sleepiness. By contrast, the estimated rate of daytime sleepiness in the 2005 Sleep in America poll was 27% [36], which might have included African Americans and Caribbean Americans. Comparatively, estimates of daytime sleepiness in Sweden, France, and in the UK were 16%, 20%, and 15%, respectively [39, 42, 43]. Of particular interest is the observation that rates of daytime sleepiness among Caribbean-born blacks in our study were also higher than that generally observed for blacks (19%) [44], who typically experience more severe daytime sleepiness than do age-matched whites [18, 34, 35]. These findings support the notion that blacks in America do not constitute a homogenous group regarding snoring and daytime sleepiness, two of the most frequent symptoms of OSA.

Our study raises an important question regarding the rationale for aggregating blacks of differing ethnic backgrounds in published reports. Our findings and others from the social science literature point to the need to consider intraethnic variations in physical health characteristics [24, 45-50]. The same could be said for other ethnic groups as well. In a previous study, comparing American women from six ethnic groups (US-born white, East Europe, Haiti, Barbados, Trinidad and Tobago, and Jamaica), we observed differences in both physical health characteristics and sleep complaints [29]. In sum, care should be exercised when interpreting sleep data collected from participants of differing ethnicities. This is supported by a recent report from the World Health Organization, evidencing that the prevalence of sleep apnea varies considerably across countries [51].

The second important finding from our analysis is that a history of heart disease was the strongest independent predictor of OSA risk among Caribbean men and women. The odds of reporting OSA symptoms (i.e., snoring, daytime sleepiness, and sleep fragmentation) were 11 times greater for respondents with a history of heart disease. To a lesser degree, the likelihood of reporting OSA symptoms was also associated with a history of hypertension, reduced satisfaction with sleep, reduced ability to concentrate, and inability to stay awake while watching TV. It is interesting to note that BMI was not an independent predictor of OSA risk in our analyses. One explanation for this observation is that BMI had shared variance with two other significant factors in the model namely, a history of heart disease and a history of hypertension.

The association of heart disease with OSA symptoms was expected, since numerous studies have established that OSA is more prevalent among individuals with cardiovascular disease [8, 10, 52, 53], congestive heart failure [9], and arrhythmias [52]. Furthermore, data from the Sleep Heart Health Study evidence that sleep apnea increases the risk of heart failure by 140%, the risk of stroke by 60%, and the risk of coronary heart disease by 30% [9]. However, we were surprised by such a high frequency of OSA symptoms among participants with a history of heart disease. This is particularly alarming given the fact that only 10% of patients with OSA have received a diagnosis, which is often attributed to a lack of training among primary-care physicians [54–57] and lack of referrals for sleep assessment when symptoms are detected [58].

One implication of these findings is that Caribbean-born patients with a history of heart disease should be a prime target for interventions that promote adequate screening and timely diagnosis of sleep apnea. A recent chart audit survey conducted in a sleep clinic serving primarily minority patients in Brooklyn revealed that black patients do not routinely adhere to the physician's recommendation to see a sleep specialist (unpublished data). Caribbean American patients with a history of heart disease should receive a brief screening for sleep apnea while attending regular visits in primary-care facilities. Screening instruments are available and can be easily administered by the medical staff. Appropriate referrals for comprehensive sleep assessment should be encouraged.

Conclusion

As expected, individuals at high risk for OSA had a higher prevalence of sleep-related complaints, compared with individuals at low risk for OSA. The fact that Caribbean-born blacks in the present study had a higher rate of sleep-related complaints than previously determined [28] might reflect the fact that respondents in the present study were recruited in the clinical setting, although they were not necessarily seeking help for sleep problems. Thus, estimates derived from our sample cannot be used in a head-to-head match with population-based estimates.

Our study has some limitations regarding generalizability to the whole population of Caribbean-born individuals. Judging from the geographic location of the participating clinics, most of the patients were either from Jamaica, Haiti, and Trinidad and Tobago, which by no means constituted an accurate sampling of Caribbean people living in Brooklyn, NY. Additionally, our sample comprised patients attending regular visits with their physicians, who evidently had medical problems likely affecting their sleep. Notwithstanding this limitation, our data suggests the possibility that Caribbean-born blacks may be at greater risk for developing OSA than African Americans and whites and that those with a history of heart disease might be particularly vulnerable. This suggests that more aggressive effort should be made to increase screening rates for sleep apnea in that population, thereby increasing the likelihood for early detection and treatment to prevent cardiovascular complications. Future studies should assess sleep patterns among Caribbean Americans using epidemiologic methodologies.

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