Original Article

The symptoms and risk of sleep apnea among adults in the United Arab Emirates

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Abstract:

INTRODUCTION: Recently, sleeping disorders and snoring are being recognized as a public health concern with various risk factors and health consequences. The main objective of the present study was to determine the prevalence of snoring and sleep apnea among adults (20–60 years) in Sharjah (United Arab Emirates, UAE) and assess the major risk factors as well as the general knowledge among the population.

METHODS: A self-administrated Questionnaire of five sections including both Berlin questionnaire (BQ) and the Epworth Sleepiness Scales (ESS) were given to a randomly selected population in Sharjah between the ages of 20–60 years. Data were analyzed using SPSS software version 22.0.

RESULTS: Nearly 34.2% of the study population reported to be snorers, and 43.2% of snorers were at high risk of sleep apnea based on the BQ. Gender was significantly associated with snoring ($P = 0.038$), as 40.8% of males reported snoring compared to 28.7% of females. Elderlies (50–60 years) were at a higher risk, and obesity (body mass index >30) was considered to be a powerful risk factor as 46.8% of the obese participants reported snoring. Those who scored higher on the ESS were more likely to be snorers ($P = 0.001$) and were likely to fall into the high-risk category in the BQ ($P = 0.007$). In addition, smoking ($P = 0.005$), hypertension ($P = 0.005$), and nasal septal deviation ($P = 0.024$) were also considered as risk factors.

CONCLUSION: Prevalence and major risk factors within the UAE are similar to those in other countries. Sleeping disorders and snoring campaigns and management facilities should be considered to raise the awareness about these issues and manage their risk factors.

Keywords:

Berlin questionnaire, epworth sleepiness scale, sleep apnoea, sleeping disorders, snoring

Snoring is defined as a harsh, loud, vibratory sound that occurs during sleep due to partial blockage of the upper respiratory tract, especially at the oropharynx.[1] It is well known that snoring can be an indicator of a serious underlying condition and can affect the quality of sleep, therefore; many studies have been done to understand the risk factors, complications, and general population's knowledge about snoring.

Simple snoring happens in the absence of obstructive sleep apnea (OSA) or the absence of daytime sleepiness.[2] On the other hand, habitual snoring (HS) is the presence of loud snoring for at least 3 nights/week and has been associated with OSA.[3] HS has been considered as an important health risk, and thus, it has been a focus for researchers.

Snoring is very common worldwide; several epidemiological studies in different regions of the world were conducted to investigate this phenomenon. In the Gulf region, the most notable research was done in Saudi Arabia in 2015,[3] where the percentage of snorers in the study was 40% of which

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23.5% were habitual snorers. The major associative factors to snoring based on that study were aging, male gender, hypertension, daytime sleepiness, smoking, and consanguinity.

In addition to the previously mentioned factors, numerous studies have highlighted the relationship between smoking,[4] alcohol intake,[5] and body mass index (BMI)[6] with snoring and OSA. One of which suggested that BMI is the major risk factor for snoring among women in China.[7]

Snoring, in addition to being a potential sign of an underlying serious disorder, it can also be a source of social embarrassment or marital problems. It affects the quality of the partner's sleep due to its impact on the sleeping pattern, and the sleep disturbance may lead to many unwanted consequences in a marital relationship.[8] However, in some cultures, snoring may not be considered as a comorbid factor, but people perceive it as a rather normal part of adult sleep, or it is related to certain types of jobs.

In the present study, we aimed to determine the prevalence of snoring and sleep apnea and their associated risk factors in a randomly selected population of adults in the UAE between 20 and 60 years of age. Given the fact that few studies have been conducted in the UAE about adults snoring and OSA, we wish that the outcomes of the present study will provide our health authorities with the required data to identify the major risk factors of snoring and sleep apnea as well as raising awareness.

Methods

Study design

The present cross-section study was conducted in Sharjah city between February 2016 and April 2016 and is mainly based on a self-administrated questionnaire. This study was approved by the Ethics and Research Committee at the University of Sharjah. The following are the criteria for eligibility (i) male and female (ii) age between 20 and 60 years and (iii) spoken the language is Arabic and/or English. A written informed consent was obtained from all the participants.

Sample of the study

The sample size was calculated by the formula: $N = \frac{4P(1-P)}{ME^2}$. The *P* in the formula represented the expected prevalence of snoring whereas; ME represented the margin of error (maximum difference between the sample proportion and the population proportion which was set at 0.05). *P* value was estimated from the Saudi study, where the prevalence of snoring was 40% ($P = 0.4$).[3] Therefore, the sample size in the present study was equal to 384, but this number was expanded to reduce any margin of error, and the final sample number was 434. Probability simple random sampling method was utilized.

Instrument of the study

A self-administered anonymous questionnaire was prepared based on previous literature resources. A pilot study was done on a sample of 15 subjects, and then, the questionnaire was modified and reviewed by the Department of Family and Community Medicine in the University of Sharjah to confirm the questionnaire validity and reliability for this study. The questionnaire was distributed to a random sample of 434 based on the above-mentioned inclusion criteria.

Participants were asked to complete a structured questionnaire with a total of 40 questions divided into five sections; the first section examined the demographic information and medical history, the second section was about sleep description and lifestyle questions. The third section assessed sleeping patterns and daytime sleepiness, which was measured by the Epworth Sleepiness Scale (ESS). The latter differentiates between average sleepiness and excessive daytime sleepiness using an 8-item questionnaire, each question has a score from 0 to 3. Results are divided into four categories based on respondents' scores: 0–10 is Normal, 11–14 is mild sleepiness, 15–17 is moderate sleepiness, and ≥18 is severe sleepiness. ESS was conducted to the whole sample using both English, and Arabic versions of ESS were previously tested and validated.[9,10,11]

The fourth section included Berlin questionnaire (BQ) which is used to measure the risk of developing OSA as well as describing the characters of individual snoring and therefore, only snorers were eligible to complete the BQ. It has a total of 10 questions, which are divided into three categories. Participants were considered at high risk for OSA if they scored ≥2 positive categories. BQ was also used in both English, and Arabic versions and reliability and validity of this version were tested previously[12,13] The last section discussed general knowledge and attitudes toward snoring and snorers.

Data analysis

Data were analyzed using SPSS software Version 22.0 software package. Descriptive statistics were initially conducted, and different tests were utilized for making statistical comparisons between variables. Parametric tests such as the independent sample *t*-test and One-way ANOVA were used for analyzing continuous variables to single out significant relations. Pearson and Spearman

correlation (ρ) tests were also used to track direction and strength of associations between continuous, continuous-ordinal or ordinal-ordinal variables. Pearson Chi-square test (χ^2) was applied to compare between categorical variables. Level of significance was set at 5%, in which $P \leq 0.05$ were considered to be statistically significant. The 95% confidence interval (95% CI) for the proportion was calculated by the following formula: $P \pm 1.96\sqrt{\frac{P(1-P)}{n}}$ (95% CI → z = 1.96, P: Point estimate of the prevalence, *n*: Sample size). BQ and ESS scores were analyzed and grouped to assess the risk of OSA and measuring tendency for daytime sleepiness.

Results

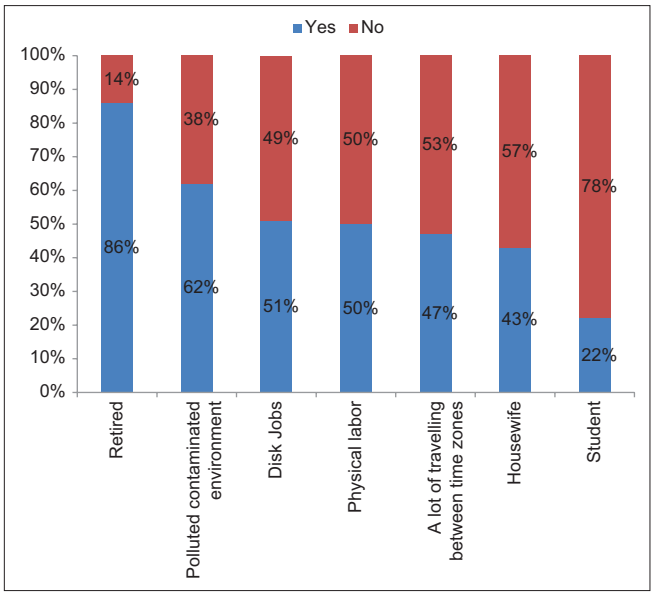
Out of 434 questionnaires that were distributed, a total of 407 questionnaires were completed by individuals who matched the inclusion criteria and the response rate was 93.78%. Demographics and major significant correlation are summarized in Table 1.

Regarding sleep description and pattern, our sample was asked to report average daily sleeping hours in addition to other sleep-related questions [Table 2]. It was noted that 54.1% ($n = 220$) from our population reported waking up during sleep, 60% of them ($n = 132$) more than once per night. Out of the 220, 84 respondents had trouble going back to sleep.

Snoring: Prevalence and risk factors

In the study population, 34.2% ($n = 139$) were snores, 45.5% ($n = 185$) were nonsnorers and 20.4% ($n = 83$) did not know whether they snore or not (95% CI = 34.2 ± 4.4). Among the snorer's population, 43.2% ($n = 60$) fell under the high-risk snorers categories based on BQ. Gender was significantly associated with snoring ($P = 0.038$, $\chi^2 = 6.562$, df = 2), as 40.8% of males were snorers, compared to females (28.7%). Snoring had also a substantial relationship with age ($P < 0.0005$, $\chi^2 = 36.808$, df = 6), as 66% of the respondents between the age group of 50–60-year-old were snorers whereas snoring was found only in 22.1% of younger individuals aged 20–30 years. Graph 1 shows the prevalence of snoring among different occupation categories. The highest snoring prevalence was noted in both "retired" and "work in polluted, contaminated environment" categories. Students were the lowest to report snoring.

BMI was another major risk factor for snoring as shown in our results ($P = 0.003$, $\chi^2 = 26.772$, df = 10), with an evident increase in the percentage of snoring within higher BMI groups. Obesity was the highest risk for snoring with 51% of obese participants reported loud snoring, while only 23.3% ($n = 95$) of the normal weight individuals were snorers. Although BMI



Graph 1: This graph shows prevalence of snoring among different types of occupations

was an important factor, exercise level, and physical activities were not directly associated with snoring. Smoking was also a very important determinant of snoring ($P = 0.005$, $\chi^2 = 10.566$, df = 2) as >40% of smokers were snorers, compared to only 32.8% of nonsmokers.

With regard to chronic conditions, hypertension and nasal septum deviation were significantly correlated with snoring, hypertensive respondents were at a much higher risk to be snorers than normotensive ($P = 0.005$, $\chi^2 = 10.766$, df = 2), ($n = 18$ out of 24 hypertensive respondents were snorers). Individuals who suffered from nasal septum were also at a higher risk for snoring ($P = 0.024$, $\chi^2 = 7.496$, df = 2), as 49.2% of them were snorers.

Risk for daytime sleepiness and sleep apnea

ESS was predictive of snoring, as individuals who fell into higher categories were more likely to be snorers ($P = 0.001$, $\chi^2 = 15.556$, df = 3). Daily sleeping hours were negatively correlated with ESS, in which individuals with less sleeping hours had higher grades in the scale ($P = 0.005$, Spearman correlation coefficient = −0.140). It is also important to mention that among snorers; the higher their score was in ESS, the more chance to fall in more positive categories in BQ ($P = 0.007$, Spearman correlation coefficient = 0.133). Out of the 139 snorers population, 65 respondents had one positive category, while 60 respondents had ≥2 positive categories in BQ. Out of those 60 respondents, 24 had also significant scores in ESS ranging between 11 and 24 points.

Table 1: Demographics and risk factors of snoring based on data collected from a population sample in Sharjah (United Arab Emirates)

Variables	Demographics	Percentage snorers	*P* value of the variable
Gender	Males: 45.2% (*n*=154)	Snorers: 40.8% (*n*=75)	0.038
		Nonsnorers: 41.3% (*n*=76)	
		Don't know: 17.1% (*n*=33)	
	Females: 54.8% (*n*=223)	Snorers: 27.5% (*n*=64)	
		Nonsnorers: 48.9% (*n*=109)	
		Don't know: 22.4% (*n*=50)	
Age*	20-29 years old: 38.7% (*n*=154)	Snorers: 22.1% (*n*=34)	<0.005
		Nonsnorers: 57.8% (*n*=89)	
		Don't know: 20.1% (*n*=31)	
	30-39 years old: 28.4% (*n*=113)	Snorers: 36.3% (*n*=41)	
		Nonsnorers: 38.9% (*n*=44)	
		Don't know: 24.8% (*n*=28)	
	40-49 years old: 21.1% (*n*=84)	Snorers: 36.9% (*n*=31)	
		Nonsnorers: 47.6% (*n*=40)	
		Don't know: 15.5% (*n*=13)	
	50-60 years old: 11.8% (*n*=47)	Snorers: 66.0% (*n*=31)	
		Nonsnorers: 19.1% (*n*=9)	
		Don't know: 15.5% (*n*=7)	
BMI	BMI >30: 23.6% (*n*=96)	Snorers: 51% (*n*=49)	<0.005
		Nonsnorers: 29.3% (*n*=28)	
		Don't know: 19.8% (*n*=19)	
	BMI <30: 75.4% (*n*=311)	Snorers: 28.9% (*n*=90)	
		Nonsnorers: 50.5% (*n*=157)	
		Don't know: 20.6% (*n*=64)	
Hypertension	Hypertensives: 7.7% (*n*=31)	Snorers: 58.1 (*n*=18)	0.005
		Nonsnorers: 19.4% (*n*=6)	
		Don't know: 22.6% (*n*=7)	
	Normotensives: 92.3% (*n*=374)	Snorers: 32.1% (*n*=120)	
		Nonsnorers: 47.6% (*n*=178)	
		Don't know: 20.3% (*n*=76)	
Nasal septum deviation	Respondents with nasal septum deviation: 15.1% (*n*=61)	Snorers: 49.2% (*n*=30)	0.024
		Nonsnorers: 32.8% (*n*=20)	
		Don't know: 18% (*n*=11)	
	Respondents without nasal septum deviation: 84.9% (*n*=343)	Snorers: 31.5% (*n*=108)	
		Nonsnorers: 47.8% (*n*=164)	
		Don't know: 20.7% (*n*=71)	
Smoking	Moderate/heavy smokers: 12.8% (*n*=52)	Snorers: 51.9% (*n*=27)	0.005
		Nonsnorers: 40.4% (*n*=21)	
		Don't know: 7.7% (*n*=4)	
	Non/light smokers: 87.2% (*n*=355)	Snorers: 31.5% (*n*=112)	
		Nonsnorers: 46.2% (*n*=164)	
		Don't know: 22.3% (*n*=79)	

*Mean age was 34.71, SD=10.75. SD=Standard deviation, BMI=Body mass index

Knowledge and awareness toward snoring

Regarding general knowledge about snoring and its associated risk factors, 68.9% (n = 279) thought that snoring is a serious health problem, and 90.9% (n = 368) thought that it is treatable. Our sample was asked about conditions in which snorers have to consult a medical professional, and the responses are shown in Graph 2. The vast majority agreed that snoring affects the roommate quality of sleep as well as affects the snorer's quality of sleep (97%, n = 394) and (72%, n = 293), respectively. In addition to that, most of our population agreed that overweight is the main risk factor for snoring (88.9%, n = 362), followed by smoking (33.7%, n = 137), age (30.2%, n = 123), and genetics (30%, n = 122).

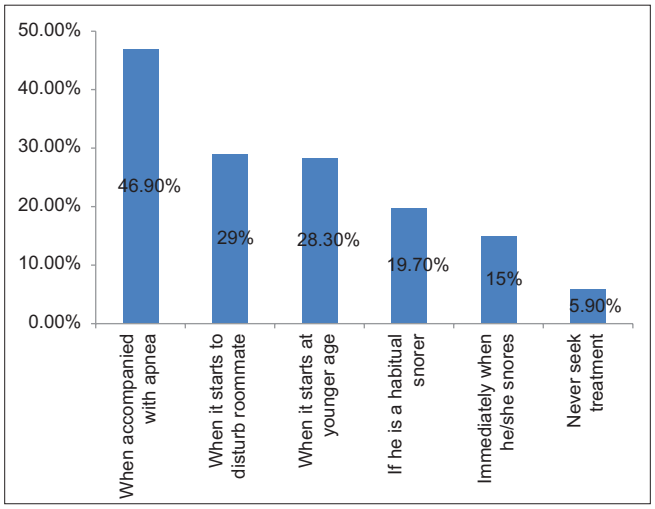
Discussion

Snoring: highly correlated with gender and age

A previous study done in Saudi Arabia on a sample of 578 males showed that snoring was present in 52.3%.[14] However, another study done also in Saudi Arabia on a sample of 400 females showed that snoring was

Table 2: Summary of sleep related questions collected from Sharjah population sample (United Arab Emirates)

	Frequency (*n*)	Valid percentage
Average sleep hours/night		
<6 h	99	24.4
6 h	175	43.1
7-9 h	122	30.0
>9 h	10	2.5
Total	406	100.0
How do you feel after sleep?		
Refreshed	146	36.5
Sleepy	254	63.5
Total	400	100.0
Do you take sleep medications?		
No	395	97.3
Yes	11	2.7
Total	406	100.0
Usual sleep position		
On side	231	57.2
No particular position	100	24.8
On back/on stomach	76	18
Total	407	100.0



Graph 2: Conditions in which snorers should seek medical treatment

present only in 40.8%.[15] Moreover, a Jordanian study done in 2008 showed a significant relation between high risk-OSA and gender, as it was present in 19.1% of males compared to 14.7% of females.[16] In our study, gender was significantly associated with snoring (P = 0.38) as 40.8% of males were snorers compared to 28.7% of females. Multiple studies and imaging methods have been focusing on the upper airway, and magnetic resonance imaging has shown that length of airways, the tongue, the soft palate, in addition to the total amount of soft tissue in the throat are less in women.[17] Although it may be expected to get occluded easier in females, that did not happen. It appears that men have long, soft oropharynx with a bigger fatty posterior tongue, so increasing the susceptibility of the large airway to collapse and put them at a higher risk for snoring and OSA. Gender variations in collapsing were most prominent during non-rapid eye movement (non-REM) sleep.[17]

In this study, we found that snoring and age are highly associated (P < 0.0005), and it was mostly notable between the ages of 50–60 as 66% of them were found to be snorers compared to only 22.1% of younger adults. Snoring tends to increase with age due to several factors such as the general loss of muscle tone, which increases the tendency of upper airway collapse, chronic conditions such as diabetes and mental retardation, obesity, and wide neck circumference.[18]

The increased prevalence of snoring in some chronic conditions; obesity and hypertension

BMI was another major risk factor for snoring as shown in our results (P = 0.003), which was consistent with a study done by Bloom *et al*., in 1988[19] which reported that regardless of gender, snoring prevalence was greater in obese subjects in each age groups, with obese individuals having 3-fold higher risk than normal weight individuals. This might be explained by the deposition of excess adipose tissue in the upper respiratory region of obese individuals which can compress and block airways during sleep. Men are more predisposed to this since generally they are known for having more fat around the neck.[20]

Hypertension was significantly associated with a higher risk of snoring in our study. A recent study by Martínez-García *et al*., in 2013[21] reported that treating OSA can help people with the treatment of resistant hypertension. In the study, researchers provided 12 weeks of the standard treatment for OSA to nearly 200 men and women with OSA using the continuous positive airway pressure (CPAP). After this period, there was a significant decrease in 24-h mean blood pressure, diastolic blood pressure as well as improvement in the nocturnal blood pressure.

Other contributing factors with snoring: occupation and smoking

As reported previously in the results section in Figure II, students and retired occupational categories were significantly considered to be the lowest and the highest risk, respectively. This result is biased by the age factor and is not directly related to the occupation itself, as most retired individuals were in the oldest age group, the opposite of students.

Smoking is a cause for snoring, and both are directly correlated with each other, as heavy smoking was

significantly associated with a higher risk for snoring. This was proven by many previous studies; one of which by Franklin *et al*. in 2004[13] that showed higher HS incidence in smokers and ex-smokers ($P > 0.0001$), even in nonsmokers who were exposed to passive smoking. This could be explained by the fact that the tobacco and other chemicals found in cigarettes lead to throat and nasal irritation and subsequent inflammation and congestion in these structures and eventually lead to snoring.[22]

UAE population and snoring

Snorers are at high risk for daytime sleepiness which showcases the importance of detecting and managing this phenomenon, as it represents a major risk for occupational accidents, especially in jobs that require physical labor. From our respondents, approximately half of the snorers scored ≥2 positive categories in BQ ($n = 60$); nearly half of them were suffering also from daytime sleepiness ($n = 24$). Having this number of people without treatment calls for an urgent need to have more sleep clinics, CPAPs and sleep studies in the UAE. Our population needs also to be educated more about important risk factors of snoring and sleep apnea such as smoking and age. Different methods are now available to raise awareness about risk factors including media and smartphones applications. More than half of the population (53.1%) does not think a snorer should seek help even if it is accompanied by sleep apneas. This behavior has to be corrected by programs from the ministry of health to screen for snoring and sleep apnea, as some respondents may neglect seeking medical treatments due to financial issues.

Limitations of the study

Our sample only included adults in Sharjah due to access limitation, which might not accurately reflect the population in the UAE as a whole. Moreover, weight and height were self-reported, which may affect some measures like BMI.

Conclusion

Snoring is a multifactorial health problem which has many risk factors and complications, especially in the Gulf region where lifestyle and type of food consumed increase individuals risk for snoring and other sleep breathing problems. Our efforts should be more focused on finding new ways not only to manage snoring and sleeping disorders, but also the risk factors and change population attitudes toward it.

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Conflicts of interest

There are no conflicts of interest.

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