

# Prevalence of symptoms and risk of sleep apnea in Dubai, UAE

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**Purpose:** The United Arab Emirates (UAE) ranks 18th on the 2007 Forbes list of fattest countries with 68.3% of its citizens with an unhealthy weight and it is well known that weight gain and obesity are important determinants in the progression of obstructive sleep apnea syndrome (OSAS). The purpose of this study is to estimate the prevalence of symptoms and risk of OSAS in the primary health care setting in Dubai, and the relationship between obesity and sleep apnea.

**Methods:** In this prospective survey, a trained medical nurse administered the Berlin Questionnaire to a consecutive random sample of patients in the age group older than 14 years, who attended the primary health care center in Dubai Health Authority, Dubai, UAE, from September 2011 to March 2012. Based on the questionnaire answers, individuals were classified into high risk and low risk groups for OSAS.

**Results:** Based on the responses and measurement of the Berlin Questionnaire of 1214 subjects studied, 58% (n = 704) of the respondents were female, while 42% (n = 510) were male. Two-hundred-fifty-four respondents met the criteria for the high risk scoring. This gives a prevalence rate of 20.9% (out of which 22.9% of the male respondents were high risk for OSAS, while 19.5% of the females were high risk for OSAS), while the remainder of the participants were classified as low risk. The overall mean age of the high risk for OSAS female respondents was 39.95 years (standard deviation [SD] 11.73 years) and was 41.18 years (SD 14.95 years) for male respondents. The highest prevalence was observed between age 51 to 60 in both genders. Seventy percent of the high risk group had a body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup> and nearly 75% of the low risk group had a BMI < 30 kg/m<sup>2</sup>, and the mean BMI was 32.06 kg/m<sup>2</sup> (SD 5.67 kg/m<sup>2</sup>) for males and 33.59 kg/m<sup>2</sup> (SD 6.44 kg/m<sup>2</sup>) for females.

**Conclusion:** In the primary health care setting, the prevalence of symptoms of OSAS among adult UAE citizens is very high, and UAE patients are at risk for OSAS and may benefit from proper evaluation for OSAS.

**Keywords:** obstructive sleep apnea, snoring, daytime sleepiness, prevalence primary care, Berlin Questionnaire, Dubai

## Introduction

Obstructive sleep apnea syndrome (OSAS) consists of episodes in which respiration ceases during sleep from the repeated collapse of the upper airway. The most common cause of this is the partial or complete stoppage of the flow of air due to the relaxation of the muscles which surround the throat and tongue. Although a detailed discussion of the pathophysiology of airflow obstruction in OSAS is outside the scope of this article, it is clear that upper airway collapse most often results from a combination of anatomic factors that predispose the airway to collapse during inspiration, plus

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neuromuscular compensation that is insufficient during sleep to maintain airway patency. The relative contribution of anatomic versus neuromuscular factors is likely to vary greatly among individuals and may vary considerably among groups defined on the basis of age, gender, body habits, race, ethnicity, and overweightness. The prevalence of OSAS is increasing among overweight and obese patients and it is well known that weight gain and obesity are important determinants in the progression of OSAS.<sup>1</sup>

Obesity is a growing health concern in the United Arab Emirates (UAE) with health officials stating that it is one of the leading causes of preventable deaths in the UAE and the UAE ranks 18th on a 2007 Forbes list of fattest countries with 68.3% of its citizens with an unhealthy weight.<sup>2</sup> Obesity is 2.3-fold higher among UAE males and females at 14 years compared to international standards, and increases to 3.6 times at 18 years of age in males and to 1.9 times in females.<sup>3</sup> This obesity in the UAE may be related to cultural influences. The traditional dress in the Middle East is a contributing factor of obesity due to the wearing of loose, flowing garments such as the dish-dash or abayas. Excess weight gained goes relatively unnoticed as people are not wearing close fitting garments, and due to extremely high temperatures up to 50°C for a large part of the year in the last 3 years, outdoor activities may be limited and therefore inactivity and boredom can lead to excessive calorie consumption resulting in weight gain.

Obstructive sleep apnea syndrome is a common medical condition with significant adverse medical and public health consequences. Primary care has a central role for recognizing cases of OSAS in the community.<sup>4</sup> Patients attending primary care clinics tend to have a higher risk for OSAS because these patients often have chronic illnesses that are associated with OSAS. Population-based epidemiologic studies have uncovered the high prevalence and wide spectrum of severity of undiagnosed obstructive sleep apnea, and have consistently found that even mild obstructive sleep apnea is associated with significant morbidity and mortality causing an additional burden on the public health service, and it is a potentially disabling condition. The community prevalence of symptoms and/or signs of OSAS varies by region and by country.<sup>5</sup> In the United States, an estimated 9% and 24% of women and men, respectively, aged 30 to 60 years have at least mild OSAS.<sup>6</sup> In other Western countries, the overall prevalence of mild and moderate OSAS is estimated at 20% and 7%, respectively.<sup>5</sup> In New Delhi, a community-based study reported a prevalence of 14% for OSAS in middle-aged men.<sup>7</sup> In the Middle East, one study was done in Jordan and

it showed that the high risk of obstructive sleep apnea was present in 106/554 (19.1%) of men and in 96/651 (14.7%) of women ( $P = 0.042$ ).<sup>8</sup> No data on the prevalence of OSAS or the relationship between obesity and OSAS in the UAE or Dubai have been reported.

The practice of sleep medicine in Dubai began in the last 3 years and it is a relatively new specialty in the medical community. Since its inception, the specialty has grown, and now it is important to assess the prevalence of this disease in this community so this study performed a standardized survey of primary care outpatients from a diverse socioeconomic range to measure the prevalence of symptoms of obstructive sleep apnea among Dubai residents (UAE citizens and expatriates) of both genders. The data will demonstrate to the local authorities that public health initiatives with clinical support are warranted to reduce the burden of OSAS; and proper evaluation for OSAS by the health care workers is urgently needed; and expansion of sleep service in this community is needed for appropriate counseling for the high risk cases of OSAS.

## Participants

The study was approved by the ethics committee of the Dubai Health Authority and the participants were selected from consecutive patients who were >14 years of age, regardless of the reason for the visit to primary care centers in the Dubai Health Authority, which is the main Dubai government department which governs health care, medical policy, and strategy in Dubai, and monitors public and private hospitals, clinics, and medical centers in Dubai.

## Materials and methods

We used the Berlin Questionnaire as a screening tool to identify subjects who are at high risk or low risk for OSAS by identifying snoring behavior, daytime sleepiness, obesity, and hypertension.<sup>9</sup> The questionnaire was developed in April 1996 in Berlin, Germany, it is a simple instrument that has been extensively studied in primary care settings and has shown very high positive predictive value (89%) with a reasonable sensitivity and specificity of 86% and 77%, respectively.<sup>10</sup>

Patients were also asked to provide information on age, weight, height, gender, and ethnicity, and the information (specifically height and weight) was verified by qualified medical staff.

Respondents were classified as either high risk or low risk for sleep apnea based on their responses in three symptom categories. To score high for OSAS, an individual's

questionnaire must have had positive scores in at least two of the three categories. Those patients who denied having symptoms with such frequency, who did not report symptoms to permit risk assessment, or who qualified in only one category were placed into the low risk group.<sup>11,12</sup> Height was measured by using a height meter, while a weighing scale was used for measuring the weight to the nearest kilogram. Body mass index (BMI) was calculated using weight in kilograms over height in meters squared ( $\text{kg}/\text{m}^2$ ). The patients were asked to complete the questionnaire in the office in the primary health care center; then it was sent to the local study group specialist. The questionnaire was offered in English (with an Arabic translation form).

## Statistical analysis

Differences between the high risk and low risk groups for OSAS were analyzed using Statistical Package for Social Sciences (IBM Corporation, Armonk, NY, USA). Multivariate analysis of factors associated with high risk for OSAS was conducted using binary logistic regression.

## Results and demographics

One-thousand-two-hundred-fourteen questionnaires were distributed. All respondents were included in this analysis.

Based on the responses and measurement of the Berlin Questionnaire of the 1214 subjects studied, 58% ( $n = 704$ ) of the respondents were female, while 42% ( $n = 510$ ) were male, with ages ranging from 14 to 81 years. The overall mean age of female respondents was 35.87 years (standard deviation [SD] 12.19 years) and the overall mean age of male respondents was 36.76 years (SD 14.74 years). The overall mean age of both male and female respondents was 36.25 years (SD 13.32 years). Mean BMI was  $27.86 \text{ kg}/\text{m}^2$  (SD  $5.69 \text{ kg}/\text{m}^2$ ) for males and  $28.53 \text{ kg}/\text{m}^2$  (SD  $6.49 \text{ kg}/\text{m}^2$ ) for females. The overall mean BMI of both male and female respondents was  $28.25 \text{ kg}/\text{m}^2$  (SD  $6.17 \text{ kg}/\text{m}^2$ ). Table 1 shows the age and BMI of all respondents.

**Table 1** All respondents – age and BMI

	N	Minimum	Maximum	Mean	SD
<b>Descriptive statistics</b>					
Age	1214	14	81	36.25	13.32
BMI	1214	13.85	57.04	28.25	6.17
Age of females	704	14	75	35.87	12.19
BMI of females	704	13.85	57.04	28.53	6.49
Age of males	510	14	81	36.76	14.74
BMI of males	510	14.87	49.46	27.86	5.69

**Abbreviations:** BMI, body mass index; SD, standard deviation.

## Frequency distribution of age

The study revealed that nearly 74% of respondents were between the ages of 21 to 50 years. Tables 2 and 3 have more details about the age and gender distributions.

## Prevalence of risk of OSAS by age and gender

Out of 1214 respondents, 20.9% ( $n = 254$ ) met the criteria for high risk of OSAS, revealing a prevalence rate of approximately 21%, while the remainder of the participants were classified as low risk. Overall, 22.9% of the male respondents were high risk for OSAS, while 19.5% of the females were high risk for OSAS (Table 4).

## Prevalence of risk of OSAS by BMI

Seventy percent of the respondents from the high risk group had a  $\text{BMI} \geq 30 \text{ kg}/\text{m}^2$  and nearly 75% of the low risk group had a  $\text{BMI} < 30 \text{ kg}/\text{m}^2$ . Mean BMI was  $32.06 \text{ kg}/\text{m}^2$  (SD  $5.67 \text{ kg}/\text{m}^2$ ) and  $33.59 \text{ kg}/\text{m}^2$  (SD  $6.44 \text{ kg}/\text{m}^2$ ) for males and females, respectively (Table 5).

The 254 respondents with high risk of OSAS had a mean age of  $40.52 \pm 13.30$  years (range was 14 to 76 years) and a mean BMI of  $32.89 \pm 6.13 \text{ kg}/\text{m}^2$  (range was  $16.45$  to  $53.86 \text{ kg}/\text{m}^2$ ). The 117 male respondents with high risk of OSAS had a mean age of  $41.18 \pm 14.96$  years (range was 14 to 76 years) and a mean BMI of  $32.06 \pm 5.67 \text{ kg}/\text{m}^2$  (range was  $18.94$  to  $49.46 \text{ kg}/\text{m}^2$ ). The 137 female respondents with high risk of OSAS had a mean age of  $39.95 \pm 11.73$  years (range was 14 to 75 years) and a mean BMI of  $33.59 \pm 6.44 \text{ kg}/\text{m}^2$  (range was  $16.59$  to  $53.86 \text{ kg}/\text{m}^2$ ). (Table 6 and Figure 1).

## Discussion

This study is the first large data set providing information collected by a standardized protocol on snoring, sleepiness, and other features associated with sleep apnea across primary health care centers in Dubai, and it demonstrates that OSAS is highly prevalent in the general population of Dubai, as it is in other countries. Nearly 21% of the respondents in the

**Table 2** All respondents – frequency distribution of age

Age groups	Frequency	Percent
14 to 20	121	10.1
21 to 30	350	28.8
31 to 40	346	28.5
41 to 50	198	16.3
51 to 60	139	11.4
Older than 60	60	4.9
Total	1214	100.0

**Table 3** Crosstabs – age groups by gender

Age group (years)	Gender		Total
	Female	Male	
14 to 20			
Count	58	63	121
% within gender	8.3%	12.2%	10.1%
21 to 30			
Count	210	140	350
% within gender	29.8%	27.5%	28.8%
31 to 40			
Count	212	134	346
% within gender	30.1%	26.3%	28.5%
41 to 50			
Count	122	76	198
% within gender	17.3%	14.9%	16.3%
51 to 60			
Count	80	59	139
% within gender	11.4%	11.6%	11.4%
Older than 60			
Count	22	38	60
% within gender	3.1%	7.5%	4.9%
Total			
Count	704	510	1214
% within gender	100.0%	100.0%	100.0%

study were categorized as high risk of OSAS (ie, 22.9% and 19.5% of the male and female respondents, respectively).

Association of males with risk of OSAS is well described. Community-based studies from Western countries have reported OSAS is more common in males compared with females, and in Jordan, the high risk of obstructive sleep apnea was present in 106/554 (19.1%) of men and in 96/651 (14.7%) of women ( $P = 0.042$ ).<sup>8</sup> The findings of our study are really striking, showing higher prevalence of OSAS in the female respondents compared to other studies in the Gulf region (prevalence of high risk for OSAS in female respondents was 19.5% in our study vs 14.7% in the Jordanian study), which indicates that the females in Dubai are more prone to OSAS

**Table 4** Categorization of respondents at high risk and low risk of OSAS

Risk	Gender		Total
	Female	Male	
High risk			
Count	137	117	254
% within gender	19.5%	22.9%	20.9%
Low risk			
Count	567	393	960
% within gender	80.5%	77.1%	79.1%
Total			
Count	704	510	1214
% within gender	100.0%	100.0%	100.0%

**Abbreviation:** OSAS, obstructive sleep apnea syndrome.

**Table 5** Correlation between BMI and risk stratification for OSAS

BMI grouping	Risk		Total
	High risk	Low risk	
<30 kg/m <sup>2</sup>			
Count	75	717	792
% within high risk or low risk	29.5%	74.7%	65.2%
≥30 kg/m <sup>2</sup>			
Count	179	243	422
% within high risk or low risk	70.5%	25.3%	34.8%
Total			
Count	254	960	1214
% within high risk or low risk	100.0%	100.0%	100.0%

**Abbreviations:** BMI, body mass index; OSAS, obstructive sleep apnea syndrome.

risk compared to other females in the Middle East or other regions in the world, and even though OSAS is a male dominant disorder, we noticed a higher than expected prevalence of OSAS in the female respondents in Dubai.

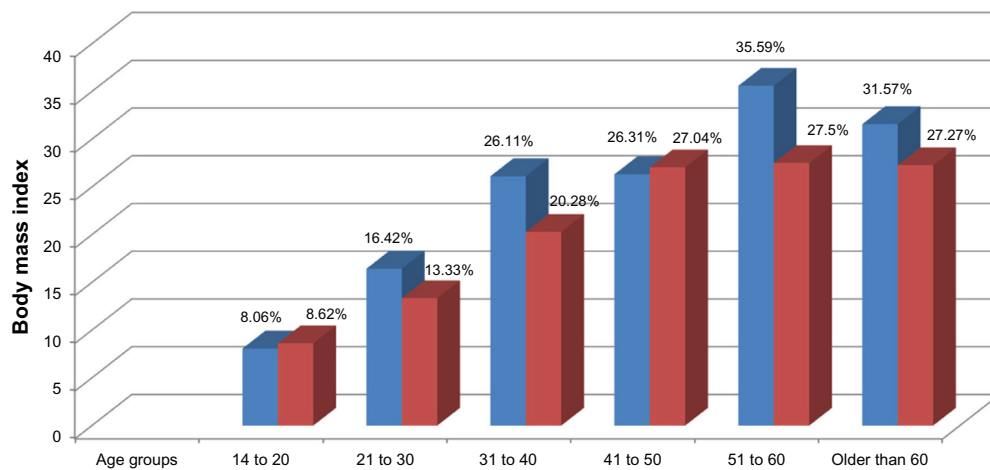
### Obesity was a strong predictor of OSAS risk

A population-based study in the United States revealed that obesity was a strong predictor of OSAS risk.<sup>13</sup> Among obese subjects (BMI ≥ 30 kg/m<sup>2</sup>), 59% of subjects were at high risk of OSAS. In a study of a Korean population, it was shown that a significant percentage of the subjects were not obese but still had OSAS. This led the researchers to speculate that other risk factors, such as content/distribution of body fat and anatomical structure of the upper airway, may be responsible for the higher prevalence of OSAS in the Korean population. Our study also revealed a close association between high BMI and the risk of OSAS in the population of Dubai; among obese subjects (BMI ≥ 30 kg/m<sup>2</sup>), 70% were at high risk of OSAS and nearly 75% of the low risk group had a BMI < 30 kg/m<sup>2</sup>, which indicates obesity in Dubai is a very strong predictor of OSAS risk.

**Table 6** All high risk respondents – BMI summaries as per age groups

Age groups (years)	Female (n)	Mean ± SD	Male (n)	Mean ± SD
14 to 20	5	28.51 ± 10.84	6	36.17 ± 7.96
21 to 30	28	33.53 ± 6.57	23	33.62 ± 6.10
31 to 40	43	34.44 ± 6.33	35	30.59 ± 6.13
41 to 50	33	32.63 ± 6.15	20	32.42 ± 5.45
51 to 60	22	34.11 ± 5.27	21	32.39 ± 3.80
Older than 60	6	35.44 ± 7.80	12	30.48 ± 4.74
Total	137	33.59 ± 6.44	117	32.06 ± 5.67

**Abbreviation:** SD, standard deviation.



**Figure 1** Prevalence of high risk Berlin Questionnaire scores by age for males (blue) and females (red).

## Obesity is more common in female respondents

Obesity in general is more common in women than men.<sup>14</sup> In the USA, 24.9% of women versus 19.9% of men had a BMI greater than 30. In Saudi Arabia, women are significantly more obese than men, with a prevalence of 44% and 26.4%, respectively.<sup>15</sup> In our study, we found that women in Dubai are significantly more obese than men (similar to Saudi Arabia) with a prevalence of 39.63% and 32.61%, respectively, and the highest BMI of the respondents was noticed in younger male and elderly female respondents. The young male respondents (age group 14 to 20 years) had a mean BMI of 36.17 kg/m<sup>2</sup> (SD 7.96 kg/m<sup>2</sup>) while the elderly female respondents (age group > 60 years) had the highest BMI among the female respondents with a mean BMI of 35.44 kg/m<sup>2</sup> (SD 7.80 kg/m<sup>2</sup>).

## The highest prevalence was noticed in the age group 51–60 years in both genders

The overall mean age of the high risk for OSAS female respondents was 39.95 years (SD 11.73 years) and was 41.18 years (SD 14.95 years) for male respondents; and the prevalence increased with age; and the highest prevalence was noticed between ages of 51 to 60 years in both genders; and the high risk of obstructive sleep apnea was present in 35.59% of men and in 27.5% of women in this age group.

## Limitations of the study

There are some potential limitations to consider. For example, we did not independently confirm or refute reporting of snoring or daytime sleepiness by the respondents. However, the concordance between patient self-reporting and bed-partner reporting

of snoring and apneic episodes is sufficiently high<sup>16</sup> to believe that there might not be over reporting of these symptoms. The study did not include information on the utility of the Berlin Questionnaire with regards to patient outcome.

The Berlin Questionnaire does not capture all information that a physician might want or seek, nor does it substitute for direct measurements of breathing during sleep (polysomnography). We did not require specialist referral or sleep studies, (which might confirm or exclude the prevalence of OSAS), but the self-report format has the advantages of convenience, simplicity and low cost, and may be more uniform in presentation compared to face-to-face screening.

## Conclusion

In the primary health care setting, the prevalence of symptoms of OSAS among adult UAE citizens and residents is very high. The population of Dubai is at high risk for OSAS and this is a serious public health issue. Patients may benefit from proper screening, evaluation, and appropriate counseling for those at high risk of sleep apnea by the primary health care physicians/workers. In addition, public awareness about the close relationship between obesity and sleep apnea may play a very important role in controlling the prevalence of obesity, and consequently OSAS in Dubai, UAE.

## Disclosure

The authors report no conflicts of interest in this work.

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