

# Prevalence of symptoms and risk of sleep apnea in middle-aged Saudi males in primary care

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## ABSTRACT

**الهدف:** لم يتم تحديد تقييم شيوع متلازمة وقف التنفس الإنسدادي أثناء النوم في المملكة من قبل. لذلك هدفت هذه الدراسة لتقييم نسبة متوسطي العمر من الرجال السعوديين الذين يعتبر احتمال إصابتهم بتوقف التنفس أثناء النوم مرتفع باستخدام استبانة برلين في عيادات الرعاية الأولية.

**الطريقة:** تمت الدراسة في مستشفى الملك خالد الجامعي ومستشفى الملك فهد للحرس الوطني بواسطة طلاب مدرسين لكل المرضى الرجال متوسطي العمر (30-65 سنة) الذين راجعوا العيادات الأولية. بناء على المعلومات المجموعة، تم تصنيف المرضى إلى احتمال الإصابة مرتفع واحتمال الإصابة منخفض.

**النتائج:** تمت دراسة 578 رجل متوسط أعمارهم  $45.02 \pm 9.3$  سنة. كان شيوع الشخير  $52.3\%$  وتوقف التنفس أكثر من مرة  $11.3\%$ . بناء على نتائج الاستبانة صنف  $33.3\%$  من المرضى على احتمال أن إصابتهم بتوقف التنفس أثناء النوم مرتفعاً.

**خاتمة:** واحد من كل ثلاثة من متوسطي العمر من الرجال السعوديين الذين يراجعون العيادات الأولية كان احتمال إصابتهم بتوقف التنفس الإنسدادي أثناء النوم مرتفعاً.

**Background:** The prevalence of obstructive sleep apnea (OSA) has not been assessed in Saudi Arabia. We aimed to assess the prevalence of individuals who were at risk of OSA in a sample of middle-aged Saudi males, using the Berlin questionnaire at primary care settings.

**Methods:** The study was conducted at King Khalid University and King Fahd National Guard primary health care clinics in Riyadh, Kingdom of Saudi Arabia between December 2005 and March 2006. Berlin Questionnaire was administered by trained medical students to consecutive Saudi male patients in the age group 30-65 years attending the primary health care clinics, after explaining the procedure of

the study. Based on the data collected and defined criteria, patients were stratified into high risk and low risk according to responses.

**Results:** Five hundred and seventy-eight middle-aged Saudi males with a mean age of  $45.02 \pm 9.3$  year were surveyed in this study. Snoring was present in  $52.3\%$ , and breathing pauses more than once per week was noticed in  $11.3\%$ . Based on the Berlin questionnaire stratification for risk of OSA,  $33.3\%$  were considered as high risk patients for OSA. The occurrence of daytime tiredness  $>$ once/week was reported by  $35.5\%$ . The prevalence of snoring and risk for OSA is similar to that reported in the US.

**Conclusions:** In primary care setting, one in 3 middle-aged Saudi males is at risk for OSA.

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Obstructive sleep apnea (OSA) is a common sleep-related breathing disorder associated with increased morbidity and mortality.<sup>1</sup> If left untreated, OSA can result in serious medical complications. Obstructive sleep apnea has been linked to hypertension,<sup>2</sup> stroke,<sup>3</sup> ischemic heart disease,<sup>4</sup> pulmonary hypertension,<sup>5</sup> congestive heart failure,<sup>6</sup> glucose intolerance,<sup>7</sup> and impotence.<sup>8</sup> Additionally, untreated OSA may affect the neuro-cognitive function of the patient. It can cause

increased daytime sleepiness, decreased concentration, and memory, and increased risk of car accidents.<sup>9</sup> The prevalence of OSA in middle-aged population was first estimated in 1993 by the ongoing population-based Wisconsin Sleep Cohort study<sup>10</sup> in a sample of 625 employed adults. The investigators found that 9% of women and 24% of men had at least  $\geq 5$  apneas or hypopneas per hour of sleep.<sup>10</sup> When the presence of extreme daytime sleepiness was included as a criterion, the prevalence was estimated to be 2% in women and 4% in men.<sup>10</sup> After that, a number of studies have reported the prevalence of OSA in different countries. Few published studies addressed OSA in Arabs and no previous studies have estimated the prevalence of OSA in Saudis using validated screening tools. We have previously estimated the prevalence of OSA in Saudi patients admitted to the coronary care unit (CCU) with acute coronary syndrome and reported respiratory disturbance index (RDI)  $>10/\text{hr}$  in 56% of the patients.<sup>11</sup> Based on published data, it seems that OSA is under-recognized worldwide particularly in the primary care setting.<sup>12</sup> In the Wisconsin Sleep Cohort Study, 93% of women and 82% of men with moderate or worse obstructive sleep apnea syndrome remained undetected.<sup>12</sup> As sleep medicine is under-developed in Saudi Arabia,<sup>13</sup> using attended or unattended polysomnography to confirm the prevalence of OSA in the general population is not feasible at the present. Therefore, other practical validated screening tools or questionnaires should be used at this stage, to get an estimate of the prevalence of this medical problem. The Berlin questionnaire is a simple, pre-designed, validated, and standardized questionnaire that has been studied in primary care settings.<sup>14</sup> It includes questions on snoring, witnessed apnea, self-reported hypertension, and daytime sleepiness, and has been found to predict an RDI of  $>5/\text{hr}$  with a sensitivity of 0.86, a specificity of 0.77, a positive predictive value of 0.89, and a likelihood ratio of 3.79.<sup>14</sup> The aim of this study was to assess the prevalence of individuals who were at risk of OSA in a sample of middle-aged Saudi males, using the Berlin questionnaire at primary care settings. Additionally, we want to compare our data to other countries.

**Methods.** The study was conducted at King Khalid University and King Fahd National Guard primary health care clinics in Riyadh, Kingdom of Saudi Arabia between December 2005 and March 2006. The medical students participating in data collection were trained on collecting data and the details of the questionnaire were explained to them. Before starting data collection, a pilot sample was collected to assess the practicability

of the questionnaire and the data gathering process. Questionnaires were administered by students to consecutive Saudi male patients in the age group 30-65 years attending the primary health care clinics, after explaining the procedure of the study. Patients outside the specified age range were excluded. The study was approved by the ethics committee in our institute.

**Berlin Questionnaire.** The Berlin questionnaire has been developed in 1996 and its validity and accuracy in primary care settings has been shown previously.<sup>14</sup> It focuses on known symptoms and features of OSA. The details of the questionnaire have been published previously.<sup>14</sup> However, in brief, the questionnaire is divided into 3 sections. Section one addresses snoring and witnessed apnea. Those who snore are asked to rate their snoring with regard to loudness, frequency, and whether their snoring bothers other people. Section 2 addresses daytime fatigue and sleepiness. And section 3 addresses personal history of hypertension, as well as height, weight, and gender. Then the body mass index (BMI) is calculated. Based on the data collected, patients were stratified into high risk and low risk according to responses. Three categories were defined based on the information collected. In category one, a positive response was defined as frequent symptoms ( $>3$  times per week) in the questions on snoring and witnessed apneas. In category 2, a positive response was defined as frequent symptoms in 2 or more questions on fatigue, sleepiness and drowsy driving. And in category 3, a positive response was defined as a self-report of hypertension and a BMI  $>30\text{kg}/\text{m}^2$ . Individuals who had positive scores in 2 of the 3 or all categories scored high risk for OSA. Individuals who did not meet the above criteria scored low risk for OSA. The high risk pre-test probability for OSA was found previously to predict an RDI of  $>5$  with a sensitivity of 0.86, a specificity of 0.77, a positive predictive value of 0.89 and a likelihood ratio of 3.79.<sup>14</sup>

Numerical values was expressed as mean  $\pm$  SD. Categorical data were expressed in the text and tables as percentages. Sigma statistical version 3, Statistical Package for Social Science (SPSS, Chicago, Illinois, USA) was used for the analysis.

**Results.** Five hundred and seventy-eight middle-aged Saudi males with a mean age of  $45.02 \pm 9.3$  year and BMI of  $27.4 \pm 5.0$  were surveyed in this study. Hypertension was present in 17.4%. **Table 1** demonstrates the distribution of responses in the surveyed group, and the results from a similar survey in the United States (US) and Europe.<sup>15</sup> In the surveyed group, snoring were present in 52.3%, and breathing pauses more than once per week was noticed in 11.3%. Snoring without witnessed apnea was present in 32.5%. Breathing

**Table 1** - Distribution of responses in the surveyed group compared to the United States and Europe.

Questions	Saudis	US* <sup>15</sup>	Europe* <sup>15</sup>
		%	
<i>Category 1: Do you snore?</i>			
Yes	52.3	67.7	65.6
<i>Does your snoring bother other people?</i>			
Yes	36.1	68.5	67.2
<i>How often have your breathing pauses been noticed?</i>			
Almost every day	1.8	5.1	3.7
3-4 times/week	3.4	2.9	4.2
1-2 times/week	6.1	2.9	6.1
1-2 times/month	13.8	4.9	5.8
Never or almost never	74.8	84.3	80.2
<i>Category 2: Are you tired after sleeping?</i>			
Almost every day	0.0	19.8	9.1
3-4 times/week	19.3	11.0	4.7
1-2 times/week	16.2	17.4	10.6
1-2 times/month	22.4	16.7	11.3
Never or almost never	42.1	35.1	64.3
<i>Are you tired during wake time?</i>			
Almost every day	8.6	22.0	8.3
3-4 times/week	10.6	12.3	4.9
1-2 times/week	18.7	21.4	12.0
1-2 times/month	17.4	19.4	13.1
Never or almost never	44.4	24.9	61.7
<i>Have you ever fallen asleep while driving?</i>			
Yes	30.0	22.9	12.0
<i>Category 3: Do you have high blood pressure?</i>			
Yes	18.0	30.7	29.6
<i>BMI &gt; 30 kg/m<sup>2</sup></i>			
Yes	26.5	32.5	16.6

US - United States. \*European patients were from Germany and Spain. Total number of male participants in the US and Europe group was 2,750.<sup>12</sup>

**Table 2** - A comparison between the main findings of our study and other published studies.

Main findings	Mean age	Snoring	High risk
		%	
Our study (n=578) Male	45.02 ± 9.3	52.3	33.3
Netzer et al <sup>14</sup> (n=744) Male + Female	48.9 ± 17.5	52.2	37
Heistand et al <sup>16</sup> (n=1506) Male + Female	49	59	31 + 21
Sharma et al <sup>17</sup> (n=180) 80% Males			44.4

pauses more than 3 times per week was present in 5.2%. The occurrence of daytime tiredness >once/week was reported by 35.5%. Of note is the high percentage of those who have fallen asleep while driving (30%). Body mass index > 30 kg/m<sup>2</sup> was present in 26.5% of patients attending the primary care service. Based on the Berlin questionnaire stratification for risk of OSA, 33.3% were considered as high risk patients for OSA, which means that one in 3 middle-aged Saudi males are at risk of having OSA and may benefit from proper evaluation for OSA. **Table 2** presents a comparison between our data and similar studies carried out in the US<sup>14,16</sup> and India.<sup>17</sup> Two of the presented studies were conducted in an outpatient clinic setting,<sup>15,17</sup> while the third used telephone interview of a representative sample of US adults.<sup>16</sup> The prevalence of snoring and risk for OSA is similar to that reported in the US.

**Discussion.** This is the first study to assess the prevalence of snoring, sleepiness and other features associated with OSA in Saudis using a validated questionnaire with high sensitivity, specificity, and positive predictive value. The results showed high prevalence of snoring and drowsy driving. Both symptoms are of concern and may have serious consequences. Snoring is an important marker for OSA. Many look at snoring as a social problem that may disturb the bed partner and ignore its medical significance. However, snoring is a predictor of subsequent diagnosis of hypertension and diabetes even after controlling for other confounders like obesity.<sup>18,19</sup> However, drowsy driving not only increases the risk of car accidents, but also is an indicator of other workplace accidents and errors.<sup>20,21</sup> The Berlin questionnaire does not replace the need for proper assessment of sleep disordered breathing using attended or unattended polysomnography; however, it gives an estimate of the size of the problem. Approximately, one in 3 middle-aged Saudi males attending primary care has symptoms and risk factors for OSA and may benefit from proper evaluation. Such evaluation requires the availability of proper specialized centers that can diagnose and treat sleep disordered breathing. Although the prevalence of high risk scores for OSA in Saudis was comparable to that in the US and Europe, the sleep medicine service in Saudi Arabia is not comparable to that in USA and Europe. It recently has been shown that the sleep medicine service in Saudi Arabia is under-developed and under-utilized compared to developed countries.<sup>13</sup> Another major obstacle that faces sleep medicine in Saudi Arabia is the under-recognition of the problem by health care providers in general and primary care physicians in particular.<sup>22</sup> Many primary care physicians under-recognize the importance and effect of OSA. Keeping in mind the serious consequences of OSA and its impact on health care utilization,<sup>9,23</sup>

it becomes obvious that there is an urgent need for supporting the existing sleep disorders programs and the establishment of new programs to meet the expected high demand. A limitation of this study is the fact that females were not included. For cultural factors, females were not interviewed. Obstructive sleep apnea is under-recognized in females worldwide possibly due to differences in clinical presentation, difference in tolerance to symptoms and cultural factors that need to be explored.<sup>10,24</sup> It is our prediction that OSA may be more prevalent in Saudi females compared to females in the West due to the fact that obesity is very prevalent among Saudi ladies.<sup>25</sup>

In summary, this study is the first survey to address the prevalence of symptoms and risk of OSA in Saudis using a standardized approach. The study has shown a high prevalence for symptoms of OSA. In the primary care setting, one in 3 middle-aged Saudi males is at risk for OSA. Considering the high prevalence and the serious consequences of OSA, efforts are needed to build up and advance this specialty in the Kingdom. Additionally, education of primary health care physicians on OSA may improve the detection rate and referral and hence, the provision of early treatment and the prevention of complications.

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