

Prevalence of Symptoms and Risk of Obstructive Sleep Apnea Syndrome in the General Population

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Abstract

Background: Obstructive sleep apnea (OSA) syndrome is one of the most common sleep breathing disorders with significant consequences. The present study aims to determine prevalence of symptoms and risk of OSA in the general population of Kermanshah, Iran.

Methods: From 2007–2008 by random-cluster-sampling, 527 adult subjects were selected from the urban region of Kermanshah. The age range of the sample was from 20 to 87 years. Assessment was carried-out using the Berlin questionnaire, a valid scale that determined those at “high risk” and “low risk” for OSA symptoms. Common symptoms were later defined.

Results: There were 144 (27.3%) out of the 527 subjects with a mean age of 48.6 ± 16.6 years and a body mass index (BMI) of 25.1 ± 3.3 at high risk for OSA (men 19%; women 8.3%); 261 (49.5%) suffered from snoring with a higher frequency among women (51.5%). From those who snored during sleep, 51 (10%) reported a breathing pause more than once per week. Subjects considered at high risk had a clinical history of diabetes (15.3%) and heart failure (16.7%).

Conclusions: Prevalence of symptoms, risk of OSA and associated factors in Kermanshah are noticeable. Considering the adverse effects of this condition on quality of life, further research in an effort for early diagnosis and treatment are recommended.

Keywords: general population, obstructive sleep apnea, prevalence, risk

Introduction

Obstructive sleep apnea (OSA) syndrome is one of the most common breathing disorders in sleeping adult humans, which has been the focus of extensive research in developed and developing countries.^{1–3} This syndrome is correlated with adverse outcomes on health and quality of life, in addition to a potential cause of drowsiness and fatigue during the day. Such outcomes may result in neuropsychological changes such as decreased concentration and memory, and an elevated risk for motor vehicle accidents.⁴ Additionally, diagnosis of OSA in different age and gender groups has been correlated with conditions such as obesity, cardio-pulmonary arrest, cardio-pulmonary hypertension, cardiac arrhythmia, congestive heart failure, stroke and type-2 diabetes.^{5–13}

The robust association between OSA and conditions such as cardiovascular diseases and diabetes are the main health problems in both developed and developing countries. This has encouraged healthcare workers to assess its prevalence in order to provide an early diagnosis of OSA with subsequent treatment. Several studies have been undertaken in different, mainly developed countries which addressed the risk of OSA.^{14–16} However, in recent years additional studies have emerged from developing countries. A study from Tunisia (n=63 cases) reported a mean of 16 (SD=4)

for the Epworth Sleepiness Scale score and 51.7 (SD=28.6) for the Apnea/Hypo-apnea Index (AHI). Based on AHI results, the researchers concluded that 44% of their patients suffered from severe OSA.¹⁷ subsequently, a recent Pakistani cross-sectional study using the Berlin questionnaire revealed that 12.4% of the participating individuals (18 years old and older) were at high-risk. Higher body mass index (BMI >27.5 kg/m²), snoring, and hypertension were more prevalent among high-risk sleep apnea individuals.¹⁸

Iran has one of the largest populations among Middle-Eastern countries that suffer from both communicable and non-communicable disorders. To our knowledge, there is no published study on the prevalence of OSA in the general population of Kermanshah. Hence, this study aims to provide an estimate of the prevalence of risk of OSA and its associated conditions.

Materials and Methods

This study was approved by the Ethics Committee of Kermanshah University of Medical Sciences (KUMS). We conducted this study in Kermanshah, the central city of Kermanshah province located in western Iran with a population of 822,921 (year 2005) in June 2008. Having assumed 20% of the people at high risk for apnea and a precision of 4% for estimated prevalence with 95% confidence interval, we needed to randomly select 384 people. According to statistical information of the households in Kermanshah Health Center, randomly 50 clusters from different areas of the city were selected. From each cluster 8 – 12 persons aged ≥ 20 years were included. When there was more than one person in a family with age ≥ 20 , we included all who were available during our visit. Finally, 527 subjects were surveyed in this prevalence study.

Using the Berlin questionnaire, data were collected from the study sample. A well-trained member of the research team was responsible for data collection, which took place in subjects'

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residences. After a brief explanation about the study goals, all subjects provided informed consent and questionnaires were completed. Overall, subjects' cooperation was good and there was no difficulty in locating subjects. Approximately more than 95% agreed to participate in the study. For those who refused to participate, we selected people from the next household until an adequate sample size was obtained.

The Berlin questionnaire is a simple and validated tool for the prediction of sleep apnea risk. It was developed in 1996, and the questionnaire's validity and reliability in the primary care setting has been shown previously. Netzer and colleagues studied validation of the Berlin questionnaire in five primary care sites in the United States. They evaluated 744 adults of which a subset was monitored with portable sleep monitoring (ambulatory polysomnography recorder) at home to measure respiratory events per hour during sleep. According to the Respiratory Disturbance Index [RDI], they concluded that the Berlin questionnaire is a valid means for identifying the risk of sleep apnea. Additionally, the authors reported a high sensitivity value of 0.86, specificity of 0.77 and positive predictive value of 0.89.¹⁹ Recently Abrishami and colleagues, in a systematic review, identified and evaluated the current screening OSA questionnaires. They demonstrated that in predicting the existence of OSA (AHI/AIC 5), the Berlin questionnaire had the highest specificity compared to others. The researchers also demonstrated that although the Berlin questionnaire has a high sensitivity for detecting OSA (72.0%), it is relatively less sensitive in detecting moderate and severe cases.²⁰

In Iran, Amra and colleagues have used a single-blind approach to translate the Berlin questionnaire into Persian (Farsi) and back into English to ensure the validity of their translation. Afterwards, they the questionnaire as a valid tool in their studies.^{21,22} The questionnaire contains three sections, where section one addresses snoring and witness apnea. Participants were asked to score their snoring. Section 2 investigates daytime fatigue and sleepiness during day activities and section 3 focuses on medical history as well as demographic and anthropometric measures such as height and weight. Sections 1 and 2 were assumed to be positive if the total score was two or more. Section 3 was considered as positive if people had hypertension or a BMI >30 kg/m². Accordingly, people were stratified as "high risk" if there were two or more sections with positive scores. In addition, subjects were asked to report if they have been diagnosed by any health care worker with any of the following conditions: stroke, coronary artery diseases, heart failure and diabetes.

Statistical analysis was carried out with the Stata software. After descriptive analyses, in order to recognize the potential risk of OSA, we used the two-sample *t*-test for quantitative variables and chi-square test for qualitative variables. Level of significance for all analyses was set at alpha less than 0.05.

Results

Our study population consisted of individuals aged 20–87 years with a mean age of 48.6±16.6 years and BMI of 25.1±3.3. Snoring was present in 49.5% of cases. From those who snored during sleep, 51 (10%) reported a breathing pause more than once per week. Daily daytime tiredness (26.6%) and drowsiness during driving (26.4%) were reported by cases. Hypertension was present in 14.2% (Table 1).

From 527 participants, 144 (27.3%) were categorized as high risk

for OSA. Those were more likely to have conditions such as a previous stroke, coronary artery disease and diabetes (Table 2). In addition, they were more likely to have higher BMI (Table 2). However, patients considered as «high risk» were almost comparable with those considered as «low risk» in terms of mean of age, sex (Figure 1), level of education and history of heart failure (Table 2).

Table 1. Distribution of responses of the Berlin questionnaire in the surveyed group.

Question	(%)
Do you snore?	
Yes	49.5
Does your snoring ever bother other people?	
Yes	27.6
How often your breathing pauses have been noticed?	
Nearly every day	1.3
3–4 times a week	1.3
1–2 times a week	7.4
1–2 times a month	82.2
Never or nearly never	7.8
Are you tired after sleeping?	
Nearly every day	26.6
3–4 times a week	15.4
1–2 times a week	13.9
1–2 times a month	14.8
Never or nearly never	29.3
Are you tired during wake time?	
Nearly every day	25.7
3–4 times a week	26.2
1–2 times a week	21.7
1–2 times a month	26.4
Never or nearly never	0
Do you have high blood pressure	
Yes	14.2
No	73.2
Do not know	12.5
Body mass index	
Normal (<25 kg/m ²)	53.3
Overweight (up to 30 kg/m ²)	38.0
Obese (≥30 kg/m ²)	8.7

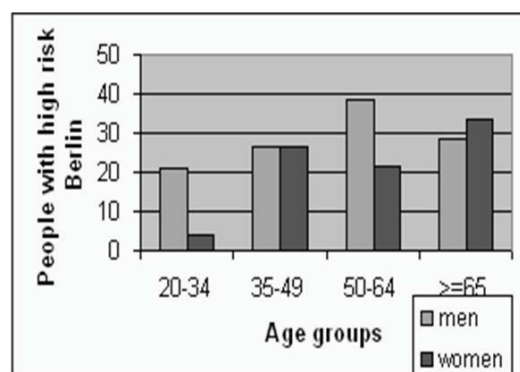


Figure 1. Bar graph presenting individuals at high risk by age clusters and gender.

Discussion

This study is among the earliest general population surveys for investigating people at of OSA in Iran. Using the internationally

Table 2. Baseline characteristics* of people with or without obstructive sleep apnea (OSA).

Baseline characteristics	High risk OSA (n=144)	Low risk OSA (n=385)	P-value
Age	50.8±15.6	47.8±16.9	0.06
Sex (female)	8.3	13.8	0.09
Education			
Illiterate	31.3	23.0	0.06
Dropped out of high school	32.6	30.0	
High school certificate	20.8	22.2	
Educated (undergraduate and graduate)	15.3	24.8	
Body mass index	26.4±4.2	24.6±2.8	<0.001
Stroke	5.6	1.0	0.005
Coronary artery disease	9.7	5.0	0.04
Heart failure	16.7	10.2	0.08
Diabetes	15.3	2.4	<0.001
Note=*All values are presented as percent, except for age and BMI.			

validated Berlin questionnaire, we have found that 27.3% of our subjects were at high risk for OSA. There were two previous studies on the prevalence of OSA in Iran by Amra and colleagues. They have shown that the prevalence of sleep apnea symptoms is lower in Iran than the western population, which was possibly explained by the younger age of the study population in Iran.^{21,22} The researchers have reported 4.98% of their cases that have been identified as suspicious for OSA, much lower than what we reported (27.3%). Iran is a developing country faced with both communicable and increasing trend of non-communicable diseases.²³ Aging, increase in BMI and other risks for chronic conditions, are all factors directly related to OSA.^{24,25}

Because of the different methods to estimate the prevalence of risk of OSA, it is difficult to compare the reported prevalence from elsewhere. However, the prevalence of being at high-risk for OSA in Kermanshah is comparable to a report from the USA (26%)¹⁴ but lower than Saudi Arabia (33.3%) which also used the Berlin questionnaire. In Saudi Arabia, the prevalence of snoring, daytime tiredness more than per week and drowsy driving were 52.3%, 35.5%, and 30%, respectively.²⁶ The differences could be seen from inclusion of only male individuals, younger cases in the Saudi study and inherent differences in factors associated with occurrence of OSA in the two countries. Additionally, in contrast to a Tunisian study with 63 cases where 44% suffered from severe OSA,¹⁷ our study consisted of a larger sample size and lower prevalence rate for the risk of OSA. Considering the high prevalence of snoring, daytime tiredness and drowsy driving that are associated with cardiovascular disease, quality of life and increased risk of motor vehicle accident, respectively, early diagnosis and treatment programs for people who are at risk for OSA is necessary.

Knowing that our study consisted of a sample of middle-aged individuals (mean age 48.6 years) suggests that the symptoms are more prevalent in middle-aged to older individuals with a tendency for gender dichotomy; the risk of OSA is more prevalent in men but women tend to show more symptoms when they are older (Figure 1). However, at this point, the results are consistent with other reported studies.^{27,28}

Low level of education as an associated factor in the high-risk group for OSA in our study can be considered in both a future study and intervention programs for OSA. To our knowledge, there is no published study on the influence of education on OSA. Heart failure history was more prevalent in the high-risk group, which is consistent with other published studies^{7,11,13} and necessitates early diagnosis of OSA.

We encountered several limitations in this study: first, the inability to assess facial abnormality as an important factor affecting signs and symptoms related to OSA. Second, we lacked a vigorous control for specific social factors and co-morbid conditions. Third, although the Berlin questionnaire is a well-known and widely used tool for identifying risk of sleep apnea, we did not examine its validity and reliability in our study. Hence, future studies are recommended, to assess the validity and reliability of the Berlin questionnaire in the Iranian population as well as the risk for OSA and its associated factors.

Approximately more than 1 in 4 individuals from the general population in Kermanshah has symptoms and risk factors for OSA and may benefit from proper evaluation and intervention. In fact, evaluation and intervention require the availability of proper specialized centers that can diagnose and treat such conditions. Nonetheless, unfortunately, the sleep medicine services in Iran are in its infancy stages. Because of adverse consequences of OSA on health and quality of life, community based treatment programs for OSA must be considered.

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