Original Article

# Berlin questionnaire study in surgical patient in Alzahra Hospital in year 2010

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## Abstract

**Background:** To examine the prevalence of high-risk subjects of obstructive sleep apnea (OSA) and its predictive factors in patients undergoing elective surgery by using the Berlin Questionnaire.

**Materials and Methods:** 300 surgical ASA physical status I, II, III, and IV patients were surveyed. Patients were screened with the Berlin questionnaire for obstructive sleep apnea. Data of sex, age, BMI and HTN also evaluated. Data were analyzed by Chi-square test and $P < 0.05$ was meaningful.

**Results:** The Berlin questionnaire identified 25.3% (76/300) of patients as being at high risk of sleep apnea (95% confidence interval, 20%-28%). This group consisted of 195 (65%) males and 105 (35%) females. The prevalence of high-risk subjects in men were more significantly than women ($P = 0.001$). High-risk subjects also were increasing with age ($P = 0.000$) and increasing with obesity ($P = 0.000$) and arterial hypertension ($P = 0.000$).

**Conclusions:** Predictors of high risk for OSA-related symptoms were female sex, age more than 50 years, and body mass index.

**Key Words:** Berlin questionnaire, preoperative, sleep apnea

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## INTRODUCTION

Sleep apnea can cause increasing morbidity and mortality at perioperation time.[1] Thorax and upper part of abdomen surgeries cause complication in ventilation function, and result in increasing Obstructive Sleep Apnea (OSA) or central hypoventilation during surgery.[2]

In general anesthesia of patients with airways complications and problems in intubation, such as obese people, respiratory paralysis and impaired alertness should be considered.[3,4] Due to being costly and requiring long time, questionnaires screening tools are use for sleep apnea diagnosis.[5-8] Berlin questionnaire, one of the most reliable and well-known questionnaires, has 77-86% accuracy and 37.5% specificity in diagnosis of OSA among non surgery people.[8,9] This questionnaire contains 9 items which categorized based on snoring and its characteristics, daytime fatigue and its characteristics and blood pressure.

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Apnea is defined as the complete cessation of airflow for more than 10 secs, hypopnea with 50% decrease of airflow or in respiratory effort for more than 10 secs by desaturation of 3% or greater, and electroencephalogram stimulation apnea index (apnea hypopnea index) (AHI) based on number of apneas and hypopneas during sleeping.[10]

The prevalence of sleep apnea before surgery has been reported 3.2[11] and 2.8%.[12]

In a study by Chang, the prevalence of sleep apnea before surgery has been reported 24% by Berlin questionnaire, but this number decreased to 4.2% by polysomnography.[13] It seems that prevalence of sleep apnea is different in various races.

There is much evidence that sleep apnea causes morbidity and mortality before and during surgery, specifically when the surgery is related to upper respiratory track.[3-15]

Considering above issues, the aim of this study is evaluation of high and low relative frequency risk of sleep apnea in patients needed surgery with use of Berlin questionnaire.

## MATERIALS AND METHODS

This historical cohort study has performed in Alzahra Hospital among patients in need of surgery who referred to this hospital in year 2009.

Sampling was done by a simple and non-random selection, and sampling population consists of 300 individuals.

The patients in this study underwent primary clinical evaluation and sleep apnea signs were recorded. For gathering information a checking list of personal information were used, considering age, gender, body mass index (BMI), having blood pressure based on Berlin questionnaire which included heavy snoring, occasional sudden wakeup which relates to instantaneous suffocation, patient's weight and height ($m^2$). Patients with BMI > 30 were considered as obese.

Patients categorized in three groups from risk perspective which was based on Berlin questionnaires.

First category: Consistent signs (more than three to four times a week), in two or/and more question about snoring.

Second category: Consistent wake up (more than three or four times a week), sleepiness during driving or both.

Third category: Having high blood pressure background or BMI >30 $kg/m^2$.

Considering a patient for high risk means having signs of at least two categories, and patients constantly having signs of one category consider as low risk for sleep apnea.

After collecting information, these information analyzed with Chi-square test and $P < 0.05$ considered as significant.

## RESULTS

300 patients with an average age of 49 ± 40.48 were studied. 65% ($n$ = 195) of patients were male and 35% ($n$ = 105) were female. 41.6% ($n$ = 125) snored during sleeping. 53.6% had often everyday snoring.

57.7 ($n$ = 173) have respiration disturbance symptoms during sleep and 57.4% ($n$ = 172) felt tired after sleep and 42% ($n$ = 126) felt fatigue during waking time [Table 1].

In 48% ($n$ = 60) the snore was annoyance to others. 26% ($n$ = 8) fell asleep during driving. 17% ($n$ = 51) has high blood pressure 7.3% ($n$ = 22) has BMI equal or more than 30 $kg/m^2$.

25.3% ($n$ = 76) has high risk sleep apnea before surgery.

High sleep apnea relative frequency before surgery in under 50 years age patients was 16.2% and higher risk of sleep apnea during surgery in patient with equal or more than 50 years age was 37.7% ($P$ = 0.000).

In individuals with high risk, average age was 55 year and in individuals with low risk, average age was 46 ($P$ = 0.01).

High relative frequency risk before surgery was 19.1% in male patients and 37.5% for female patients ($P$ = 0.001).

High relative frequency risk of sleep apnea before surgery in patients with BMI equal or more than 30 was 54.5% and for patient under 30 years old the number was 35.5% ($P$ = 0.000). High relative frequency risk of sleep apnea among patients having blood pressure was 52% and this percent for patients not having blood pressure was 19%, which based on Chi-square test shown in Table 2, the difference was significant ($P$ = 0.000).

## DISCUSSION

The most research done about sleep apnea complications were in related to head and neck surgery. In this research paper the aim is assessing the high and low relative frequency risk occurrence of sleep apnea in patients undergo surgery which measured based on Berlin

**Table 1: Distribution of sleep apnea characters in patients after surgery based on different times**

| | No. of individuals having snoring (*n*=125) | Disruption in breathing during sleeping (*n*=173) | Fatigue after sleeping (*n*=172) | Fatigue during waking time (*n*=172) |
|---|---|---|---|---|
| Often every day | 67 | 21 | 115 | 85 |
| Three to four times a week | 21 | 4 | 19 | 8 |
| One to two times a week | 12 | 11 | 18 | 18 |
| One to two times a month | 10 | 9 | 20 | 15 |
| Often never | 15 | 127 | 128 | 128 |

**Table 2: High and low relative frequency risk of sleep apnea before surgery in patients based on age gender, BMI, and blood pressure**

| Risk | High risk (%) | Low risk (%) | *P* value | 95% confidence interval |
|---|---|---|---|---|
| Age | | | 0.000 | 0.18-0.55 |
| Under 50 years | 27 (16.2) | 140 (83.8) | | |
| Equal or more than 50 years | 49 (37.7) | 84 (62.3) | | |
| Gender | | | 0.001 | 0.23-0.67 |
| Man | 38 (19.1) | 157 (80.9) | | |
| Woman | 39 (37.5) | 66 (62.5) | | |
| BMI | | | 0.000 | 1.4-9.6 |
| Equal or more 30 | 12 (54.5) | 10 (35.5) | | |
| Less than 30 | 64 (23.1) | 214 (76.9) | | |
| Blood pressure | 27 | 24 | 0.000 | 2.4-8.6 |
| | 52.9 | 47.1 | | |

questionnaire.

For finding the individuals with high risk sleep apnea various questionnaires have been prepared which was encouraging but results and consistency were different depend on study population specifications.[16]

Berlin questionnaire is most common and reliable method in sleep apnea screening at the present time.[17]

This questionnaire has 82.5% diagnostic accuracy,[18] and if it will be answered by patient close relatives shows more accuracy.[19]

In our study, the occurrence of sleep apnea was 25.3 before surgery which compare to other research by Fidan (3.2%) and Harrison (2.8%) considered very high. In Harrison study the percentage of sleep apnea increased to 6.9 entering patients with sleep apnea background. Comparing to Chung study, the sleep apnea occurrence based on Berlin questionnaire is similar to Canadian society (25.3 to 24 for Persian and Canadian respectively).[13]

Among typical Persian race the high sleep apnea risk was 4.9%,[20] but number reached 25.3% among patients before surgery. This obvious difference emphasizes on a need for fast and precise planning for sleep apnea control to eliminate surgery complications. High relative frequency risk in sleep apnea before surgery in patients under 50 years old was 16.2% and this risk reached 37.7 for patients with 50 years old or more, which was significantly higher. In patients with high risk, average age was 55 years and in individuals with lower risk this average was 46 years, which significantly was lower. Middle age considers as a risk factor in sleep apnea.[21]

High relative frequency risk of sleep apnea before surgery in male patients was 19.1 and for female was 37.5%, which was very significant.

In Fung *et al*. and Payer *et al*., studies, being male considers as a major risk factor for sleep apnea among adolescence.[21,22] In Amra *et al*., study which took place in Persian society, the frequency of sleep apnea was seen more between females, but this relationship was insignificant.[20] However in our study among Persian race compare to other races this relationship was significant.

High risk relative frequency of sleep apnea in patient with BMI equal or more than 30 was 54.5 before surgery and for patients with BMI less than 30 the number was 35.5, which was significantly lower which is in conformity with other studies.[21,23] As BMI increases, the related sleep apnea postoperative complications increase.[22,24]

So planning for weight adjustment before going under surgery can be very effective in reducing sleep apnea complications.

High relative frequency risk of sleep apnea before surgery was 52% and 19% for patient having blood pressure and not having blood pressure, respectively, which was significantly lower for the second. Sleep apnea has direct link to blood pressure which can be result of sleep apnea physiology or related factors such as high BMI. Sleep apnea control is effective on reducing blood pressure in adolescents and reduces the related complications.[21,25] Sleep apnea control also is effective on postoperative diastolic blood pressure reduction among children.[26]

Preoperative sleep apnea complications can also cause increase in cardio-pulmonary postoperative complications.[27,28] Decrease in oxygenation in these individuals around time of surgery is a result of decrease

of exhalation reserve volume.[23]

Shan showed that sleep apnea control from year 2004, preoperatively and also postoperatively decreased surgery complications significantly.[29]

In patients with sleep apnea, the care and screening have to be done in 5 steps including: examination before surgery, intubation, surgery, extubation, and recovery.[29]

Noteworthy, recognition of sleep apnea in most patients before surgery is not always easy and possible. These patients may need CPAP or BiPAP postoperatively.

Given the high rate of respiratory complications in patients with sleep apnea,[22,27] the use of paging systems recommended for respiratory treatment which often happens around 10:30 am.[30]

## CONCLUSION

Decrease in sleep apnea with high risk should be recognized. Our research showed that high risk sleep apnea was related to patient high weight, gender (being female), high blood pressure, and higher age. The gender and age cannot be impeded, but weight and blood pressure control can be of great benefit in reducing sleep apnea risk in patients.

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Category 1

1. Do you snore?

☐ Yes ☐ No ☐ Don't know

2. Your snoring is:

☐ Slightly louder than breathing ☐ As loud as talking ☐ Louder than talking
☐ Very loud – can be heard in other rooms

3. How often does this occur?

☐ Almost every day ☐ 3-4 times per week ☐ 1-2 times per week
☐ 1-2 times per month ☐ Rarely or never

4. Has your snoring ever bothered other people?

☐ Yes ☐ No

5. Has anyone noticed that you have stop breathing during your sleep?

☐ Almost every day ☐ 3-4 times per week ☐ 1-2 times per week
☐ 1-2 times per month ☐ Rarely or never

Category 2

1. Do you feel tired after your sleep?

☐ Almost every day ☐ 3-4 times per week ☐ 1-2 times per week
☐ 1-2 times per month ☐ Rarely or never

2. During your waking time, do you feel tired or fatigued?

☐ Almost every day ☐ 3-4 times per week ☐ 1-2 times per week
☐ 1-2 times per month ☐ Rarely or never

3. Have you fell asleep while driving a vehicle?

☐ Yes ☐ No

If you answered 'Yes', please note usually how:

Category 3

1. Do you have high blood pressure?

☐ Yes ☐ No ☐ Don't know

Height (m):
Weight (kg):
Age
Male/Female
Important signs:

1. If in category 1, 2 the response is often everyday or/3 to 4 times a week to 2 or more questions
2. If in category 3 person has high blood pressure or BMI>30 kg/m$^2$

High risk: important signs in 2 of 3 categories.