

Prevalence and determinant of obstructive sleep apnea in patients attending primary health care centers in ministry of health and international medical center in Jeddah, 2018

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Abstract

Introduction: Obstructive sleep apnea (OSA) is a clinical disorder that requires early detection and intervention. This study aimed to assess the prevalence and determinants of OSA amongst patients attending the primary health care centers (PHCCs) in Ministry of Health (MOH) and the Family Medicine Department at International Medical Center (IMC) in Jeddah, thereby determining the high risk-population and highlight the impact of such sleep disorder.

Materials and Methods: A cross-sectional survey was conducted to adult subjects attending the general clinics in the five PHCCs in Ministry of Health (MOH) and the Family Medicine Department at International Medical Center (IMC) in Jeddah, Saudi Arabia. Shapiro-wilk was used to determine the normal distribution of the sample. The STOP-BANG questionnaire and Epworth sleepiness scale (ESS) were given in validated English and Arabic version. Collected data were entered and analyzed using IBM SPSS, version 24 (IBM Corp, Armonk, NY).

Results: Based from STOP-BANG analysis, the mean score was found to be 2.57, indicating that the majority of the adults under study were at low to moderate risk of having OSA. The mean score for patients who have moderate to high risk for OSA was found to be 3.97. Factors such as age, male gender, hypertension and BMI >35 were found to be significantly associated with OSA.

Conclusion: The result of STOP-BANG and Epworth sleepiness scale analysis showed that most of the adult persons were at low risk of acquiring obstructive sleep apnea and experienced less daytime sleepiness. This study concludes that factors such as age, male gender, hypertension and body mass index (BMI) were found to be significantly associated with OSA. Screening techniques such as STOP-BANG and ESS were found to be an important and useful technique in assessing the prevalence of OSA.

Keywords: Obstructive sleep apnea, Prevalence, Determinant, Primary health care center, STOP-BANG, ESS.

Introduction

OSA is a common sleep condition, explained by the world health organization (WHO) as recurrent pauses in breathing during sleep and is customarily accompanied by loud snoring.¹ The Sleep Medicine Organization also described OSA as a clinical condition in which breathing is repetitively interrupted during sleep due to collapse of upper airway.²

OSA is reported as a prevalent sleeping disorder that has been increasing over time.³ BaHammam and co-workers have found that, one in 3 middle-aged Saudi males attending the PHCCs in Riyadh is at risk for OSA.⁴ In fact, Terry young and colleagues estimated that up to 93% of women and 82% of men with OSA (moderate to severe type) maybe left undiagnosed.⁵ Furthermore, the person with sleep apnea is typically not aware of the problem. If remained untreated, OSA can bring negative impact on the health of the concerned individual as well to the society in general. Studies showed that untreated OSA can lead to serious long term effects, like coronary artery disease, heart failure, hypertension (HTN) and cerebrovascular disease.⁶ As a result of OSA, disturbed sleep patterns are also recounted to cause an increase in level of day time sleepiness, leading to days of work absence and increase level of occupational and vehicular accident.⁷⁻⁹

Due to the increasing cases of OSA worldwide, many screening approaches were developed to deal with the said problem.¹⁰ Polysomnography (PSG) is projected as the gold standard for diagnosing OSA in adult population, hence widely used in many OSA studies.¹¹ However, the use of

PSG testing may not be feasible and practical in assessing OSA in high OSA-suspected population because of its high operational cost, limited accessibility and time-consuming disadvantages.¹² Considering the high predominance of undetected and untreated OSA and its linked health and work-related effects, several simple, inexpensive, effective and easy-to-administer screening techniques were established to categorize patients who are most likely to acquire OSA.¹⁰ Some examples of these methods are STOP-BANG, Berlin and ESS questionnaire. In many studies, the STOP-BANG Questionnaire and ESS are used as screening tools in evaluating OSA.^{10,13} Reports showed that the sensitivity of STOP-BANG Questionnaire in assessing OSA were 90%, 94% and 96% for an apnea hypopnea index (AHI) of ≥ 5 (has OSA), ≥ 15 (moderate to severe OSA) and ≥ 30 (severe OSA), respectively.¹⁴ Other studies used the Arabic version of STOP-BANG questionnaire, together with PSG, to evaluate OSA on one hundred ninety-three patients. The STOP-BANG questionnaire result was found to be positive (AHI ≥ 3) in 87% of the studied respondents.¹⁵ ESS, on the other hand, increased the specificity of Stop Bang questionnaire when combined to it.¹⁶ Reports showed that ESS score was significantly increasing in STOP-BANG score of ≥ 3 , suggesting that the use of STOP-BANG as screening tool followed by ESS may emphasize the evaluation of undetected OSA.¹³ Other studies also described the subjective OSA symptoms and daytime sleepiness features using ESS to be useful tool in detecting OSA disease severity.¹⁶

OSA, being a growing health problem and becoming

more prevalent each year in Saudi Arabia.¹⁷ However, limited epidemiology-related studies were conducted to assess the prevalence of sleep apnea cases in the Middle East.^{17,18} Additional reports on prevalence and risk factors of OSA may help in obtaining significant information and therefore may assist the affected individuals to be referred for further assessment. Moreover, the early detection of OSA may serve as a cost effective process when it comes to possible complications and forthcoming health care services. It may also help in reducing economic-related burden and psychological consequences.

This research aimed to estimate the prevalence of OSA as well as its determinants in patients attending PHCCs in MOH and Family Medicine Department at IMC in Jeddah using STOP-BANG Questionnaire and ESS as screening methods.

Materials and Methods

Study Design and Area

We performed a cross sectional analytic approach to study the patients attending both the government clinics (MOH – PHCCs) and private (IMC- Family Medicine department) clinics in Jeddah, Saudi Arabia. The 48 PHCCs in Jeddah are distributed among 5 groups (based on their integration with the nearby governmental hospital), namely Al Thagar hospital, King Abdulaziz Hospital, East Jeddah General Hospital, King Fahad Hospital Jeddah and King Abdullah Medical Complex.

Study Population and Criteria

Adult patients attending the general clinics in PHCCs at MOH and the Family Medicine Department at IMC from different nationalities, religion, gender and educational background. Adult patients whose age is more than 18 years old was followed as the inclusion criteria, while the exclusion measure was considered to be Pediatrics less than 18 years old.

Sample Size and Technique

By using Roasoft calculator, the sample size was calculated following the criteria: response distribution (2.52%), population size (20.000), confidence level (99%) and allowable error (3%) and calculated sample size (180). Ten percent was added to the sample size for possible drop out while another ten percent was added for the pilot study.

The PHCCs in Jeddah are 48 centers distributed among 5 groups according to their incorporation with the governmental hospital serving the same area. Stratified multistage sampling technique was used.

First stage, one center from each group is selected randomly in addition to the family medicine department at IMC
Second stage, 30 patients were selected from each center using stratified random sampling technique.

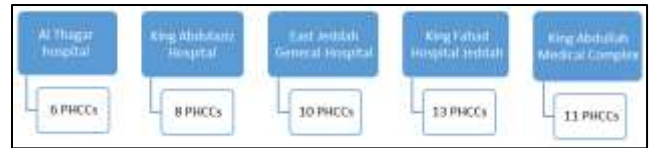


Fig. 1: The distribution of the governmental hospitals and their PHCCs.

Data Collection

The self-administered questionnaires were distributed and recollected from the adult persons who were present in the MOH-PHCCs and IMC Family Medicine department on the day of data collection (working hours) and have satisfied the set inclusion criteria. Two validated questionnaires, English and translated Arabic version, were given to the persons.^{19,20} The STOP-BANG questionnaire was given to gauge the possibility of having OSA and its risk degree.^{14,15,21} Accompanying ESS to evaluate the day time sleepiness of subjects.^{9,15}

The STOP-BANG Questionnaire result was classifying the adults among the study in terms of acquiring low (STOP-BANG Score=0-2), moderate (STOP-BANG Score=3-4) and high risk of OSA (STOP-BANG Score=5-8 or STOP Score= 2-4 with score in any of BANG questions excluding Age).²² In addition, ESS focused on determining the daytime sleepiness of patients who were found to be at moderate to high risk of acquiring OSA based on STOP-BANG analysis through identifying their “chances of dozing off” at certain situations. A score of greater than or equal to 10 indicates a possible sleep disorder.²³

Characteristics such as age, gender, HTN and BMI were also obtained from the participants. Owned electronic scale and meter was the instrument used to measure the BMI, following daily scale calibration and checking with the test mass of 10 kg. Similar standard methods and technique were applied in succeeding measurements.

Study Variables

The independent variables in this study were gender, age, weight, height, history of hypertension (HTN) and Diabetes Mellitus (DM). The dependent variables were the prevalence of adult patients at high risk of developing OSA.

Data Entry and Analysis

The data was encoded and analyzed using IBM SPSS version 24 (IBM, Corp., Armonk, NY). Categorical variables were presented as frequency distributions (tables), while continuous variables were presented as means and standard deviations (SD) at 99% confidence interval (CI). Shapiro-wilk test was used to determine the distribution type of the sample, while Mann-Whitney test was used to determine the association of selected factors towards the risk of having OSA at 99% CI.

Pilot Study

A pilot study was conducted among 10% of the sample size. This was conducted to evaluate the implementation of the questionnaire and measurements tools in terms of accuracy

and applicability. The results of pilot study were excluded from the study

Ethical Considerations

This study was allowed to be conducted after getting the approval from the JPFM research scientific and ethical committee and in both institutes; MOH and IMC. Both verbal and written consents were obtained from the participants prior to the distribution of self-administered questionnaires.

Results

Background Characteristics

In this cross-sectional type of study, the total participants from MOH and the family medicine department at IMC were 180. There were 150 respondents selected from MOH (30 participants from each PHCC) and 30 from IMC. Shapiro-wilk test was used to determine the distribution of the sample.

STOP-BANG (Questionnaire) Analysis

The validated STOP-BANG questionnaires (English and Arabic) were given to obtain data on the possibility of participants of acquiring OSA as well as its risks degree. Table 1 showed the frequency of OSA-related parameters among adult persons based from the results of STOP-BANG (Questionnaire) analysis. Among the 180 adult persons under study, more than half were found to be of male gender (50.6%), not snoring loudly (61.7%), not frequently feel tiredness or sleepy during day time (63.9%), 50 years and below (63.3%), have no case of high blood pressure (69.4%) and have BMI of less than 35 kg/m² (73.9%). In terms of other factors, more than three fourths of the participants have reported to have no more than 40 cm neck circumference (78.3%) and no experience of stop in breathing (choking/gasping) during sleep (82.8%). The STOP-BANG Questionnaire mean score was found to be 2.57 with SD of 1.75 (Minimum = 0, Maximum = 8). This mean score indicates that the majority of the adults under study were at low (STOP-BANG Score = 0-2) to moderate (STOP-BANG Score = 3-4) risk of having OSA. Specifically, most (57.2%) of the adult persons were at low risk of acquiring OSA, while about one fourth (26.1%) were at moderate risk and only 16.7% at high risk, as shown in

Table 2. This implies that the majority of the participants have experienced less of the considered characteristics associated to OSA, making them less likely to acquire the said sleeping condition.

Afterwards, the day time sleeping behavior of patients (n=77) who had moderate to high risk of having OSA (according to STOP-BANG analysis) were further evaluated using ESS.

Epworth Sleepiness Scale (ESS) Analysis

ESS results showed that majority of the respondents who were at moderate to high risk of acquiring OSA (based from STOP-BANG analysis) stated that they never experienced chances of dozing off while watching TV (51.9%), sitting and reading (61.0%), inactively sitting in a public place (63.6%), sitting and talking to someone (89.6%), as a passenger in a car for an hour without a break (75.3%) and while inside a car (stopped for few minutes) under traffic (92.2%). Nearly half (48.0%) of them reported that they never had the chance to doze off while sitting quietly after lunch without alcohol intervention. During times of lying down to rest in the afternoon when circumstances permit, about one third said that they had slight chance (37.7%) and never had the chance (35.0%) to doze off.

The ESS score mean was found to be 3.97 with SD of 3.44 (Minimum=0, Maximum=15). This low mean score (<10) indicates that the participants had experienced less daytime sleepiness and were less likely to have a sleep disorder.

The risk of having sleep disorder of patients who were at moderate to high risk of having OSA based from STOP-BANG analysis was further evaluated using ESS. In Table 4, most of the adult patients (92.2%) were found to be at low risk of acquiring the sleep disorder.

Association of OSA and some factors

The association of characteristics such as age, gender, HTN and BMI towards OSA was assessed using the Mann-Whitney test. Results showed that the factors such as age of above 50 years old, male gender, high blood pressure and BMI of more than 35 have significant association (P<0.05) towards OSA.

Table 1: Frequency of OSA-related parameters among adult patients according to STOP-BANG Questionnaire

Variable		Number	Percentage
Do you Snore Loudly (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?	Yes	69	38.3
	No	111	61.7
Do you often feel Tired, Fatigued, or Sleepy during the daytime (such as falling asleep during driving or talking to someone)?	Yes	65	36.1
	No	115	63.9
Has anyone observed you Stop Breathing or Choking/Gasping during your sleep?	Yes	31	17.2
	No	149	82.8
Do you have or are being treated for High Blood Pressure?	Yes	55	30.6
	No	125	69.4
Body Mass Index more than 35 kg/m ² ?	Yes	47	26.1
	No	133	73.9

Age older than 50?	Yes	66	36.7
	No	114	63.3
Neck circumference greater than 40cm?	Yes	39	21.7
	No	141	78.3
"Male" Gender?	Yes	91	49.4
	No	89	50.6

Table 2: Obstructive sleep apnea (OSA) risks according to STOP-BANG Questionnaire.

Variable	Number	Percentage
High risk	30	16.7
Moderate risk	47	26.1
Low risk	103	57.2

Table 3: Frequency of "Dozing off" sleeping characteristics of adult patients using Epworth Sleepiness Scale (ESS)

Variable	Number	Percentage	
Chance of dozing off while sitting and reading?	Would never doze	47	61.0
	Slight chance of dozing	22	28.6
	Moderate chance of dozing	7	9.1
	High chance of dozing	1	1.3
Chance of dozing off while watching TV?	Would never doze	40	51.9
	Slight chance of dozing	26	33.8
	Moderate chance of dozing	9	11.7
	High chance of dozing	2	2.6
Chance of dozing off while sitting, inactive in a public place?	Would never doze	49	63.6
	Slight chance of dozing	21	27.3
	Moderate chance of dozing	7	9.1
	High chance of dozing	0	0
Chance of dozing off as a passenger in a car for an hour without a break?	Would never doze	58	75.3
	Slight chance of dozing	9	11.7
	Moderate chance of dozing	10	13.0
	High chance of dozing	0	0
Chance of dozing off while lying down to rest in the afternoon when circumstances permit?	Would never doze	27	35.0
	Slight chance of dozing	29	37.7
	Moderate chance of dozing	19	24.7
	High chance of dozing	2	2.6
Chance of dozing off while sitting and talking to someone?	Would never doze	69	89.6
	Slight chance of dozing	5	6.5
	Moderate chance of dozing	3	3.9
	High chance of dozing	0	0
Chance of dozing off while sitting quietly after lunch without alcohol?	Would never doze	37	48.0
	Slight chance of dozing	22	28.6
	Moderate chance of dozing	16	20.8
	High chance of dozing	2	2.6
Chance of dozing off while in a car, while stopped for a few minutes in traffic?	Would never doze	71	92.2
	Slight chance of dozing	5	6.5
	Moderate chance of dozing	1	1.3
	High chance of dozing	0	0

Table 4: Sleep disorder risk analysis using Epworth Sleepiness Scale (ESS).

Variable	Number	Percentage
High risk	6	7.8
Low risk	71	92.2

Table 5: Association between selected factors and risk of obstructive sleep apnea (OSA) according to Mann-Whitney test

Variable	U / p value for risk of OSA according to Stop-Bang Questionnaire
Age more than 50 years	2119.500 / 0.000
Male Gender	3071.500 / 0.002
Hypertension	1746.500 / 0.000
BMI ¹ more than 35	1236 / 0.000

Table 6: Relative Risk / P value for OSA according to Stop-Bang Questionnaire

variable	Relative Risk	CI	P
Age more than 50 years	1.802	1.322-2.457	0.000
Male Gender	1.243	1.020-1.514	0.023
HTN	2.177	1.472-3.221	0.000
BMI more than 35	3.194	1.893-5.389	0.000

Table 7: Relative Risk / P value for sleep disorder risk according to Epworth Questionnaire

variable	Relative Risk	CI	P
Age more than 50 years	1.029	0.906-1.169	0.670
Male Gender	0.887	0.751-1.049	0.091
HTN	0.993	0.872-1.132	0.921
BMI more than 35	0.951	0.836-1.082	0.452

Discussion

The result of STOP-BANG analysis showed that the majority (57.2%) of the adult subjects attending the research site were at low risk of acquiring OSA, implying that most of the participants have experienced less of the considered subjective characteristics associated with OSA.

The prevalence of high risk persons for OSA in this study were found to be 16.7%. A similar study was conducted by Foroughni and colleagues²⁴ in Iran wherein results showed that 51.4% of males and 26.5% of females from different districts of Tehran were found to be at high risk of OSA based on STOP-BANG analysis. Limited studies were found for STOP-BANG and ESS-assisted OSA cases in Saudi Arabia and other Arab countries.¹⁷

According to STOP-BANG analysis, the mean score result of 2.57 implies that the majority of the adults under study were at low to moderate risk of having OSA. This suggests that the screened population may not further undergo an objective OSA diagnostic testing. This score is comparatively lower with respect to the positive STOP-BANG score (≥ 3) in 73% of all the patients in the study of Isaac and co-worker.¹³ Overall, the result of STOP-BANG analysis revealed that high percentage of adults who are suspected of having OSA were at low risk of acquiring the said sleep breathing disorder.

Moreover, the participants who were at moderate to high risk of having OSA based on STOP-BANG analysis were screened using ESS. A review on sleep studies mentioned that methods (objective and subjective) for sleep diagnosis should be used in combination to produce a synergy between the two.¹² Senaratna and others¹⁵ also mentioned in their study that the combination of questionnaires and ESS are useful in choosing participants for further diagnostic testing. Results showed that most of the adult persons have stated that they never experienced the illustrated "chances of dozing off" characteristics. This

observations can be possibly due to the idea that majority of them were not aware that they "doze off" during the said situations. It is therefore suggested that the respondents must be with their wife/husband or bed companion in answering in part of ESS test in order to lessen the bias. Moreover, the ESS score mean of 3.97 indicates that the persons had experienced less day time sleepiness and were less likely to have a sleep disorder. Overall, This is in contrast to the retrospective, cross-sectional study of Senevirante and Puvanendran²⁵ wherein the respondents who were diagnosed with OSA reported to have high prevalence (87.2%) of excessive day time sleepiness. Moreover, the ESS score in the current study is relatively lower compared to the ESS score of ≥ 11 in 20% of patients in the study of Isaac and colleagues,¹³ to the mean score of 9.8 (SD 5.0) in one of population-based Korean study of Ryu and others,¹⁶ and to the mean score of 5.9 for the participating patients in the study of Teran-Santos and co-workers in Spain.⁸ ESS results were further processed in this study to determine the risk of having EDS related to sleeping disorder. Majority of the adult subjects (92.2%) were observed to be at low risk of acquiring a sleep disorder.

By employing Mann-Whitney test, the factors such as age (> 50 years old), male gender, hypertension and BMI (> 35) were determined to be expressively related to OSA, implying that the adult subjects under study who exhibited the mentioned characteristics were significantly at more risk of acquiring OSA. Also, such factors can be considered as significant determinants in evaluating OSA. Similar studies mentioned that the aforementioned factors were considered significant predictive factors of OSA and OSA-related symptoms.¹⁷ In terms of male gender factor, Wali and colleagues¹⁷ mentioned that OSA typically occurs in men compared to women in which the male predominance may

be linked to various factors, among which may include hormonal effects in the muscles (upper airways), size, shape (pharyngeal), ventilation control, distribution of adipose tissue based on gender and collapsibility. This was supported by the results of the work conducted by Foroughni and co-workers.²⁴ With regard to age factor, Wali and co-workers¹⁷ found out that participants with the age of 50 or older had a 2.4% fold increased risk of OSA in comparison with the 30–39 years old respondents. HTN was also considered as risk factor of OSA.¹⁷ Sarkar and colleagues⁶ indicated in their report that the untreated sleep apnea has association towards hypertension and other cardiovascular-related disorders. In addition, other studies described obesity as a major determinant factor for OSA in general.^{4,18} In KSA, obesity is linked with the high incidence of threat for OSA towards Saudi women of middle-age.²⁶ Mahboub and co-workers²⁷ found out that about 22.9% of patients in selected primary care patients in Dubai, United Arab Emirates were at high risk of OSA, out of which around 70% of them had BMI of > 30 kg/m² which is equivalent to being obese. The study of Isaac and co-workers¹³ in a UK hospital also showed that more than 50 % of the participants were considered obese (BMI>30). Conventional or surgical way of losing weight is reported to reduce the intensity of sleep apnea as mentioned in the reports of Wali and co-workers.¹⁷

The use of OSA screening methods can be helpful in preventing negative consequences of OSA such as work and vehicular accidents. Garbarino and other⁷ reported that the workers with OSA conducted in their study showed near two fold increased odds of having connection in work-related accidents in comparison to those workers who are not affected by OSA. A study in Spain also indicated that sleep apnea and the risk of traffic-linked accidents were strongly associated with each other.⁸ This observation was supported by the study of Tregear and colleagues⁹ in which the untreated sleep apnea of drivers (ESS score \geq 11) was found to significantly contribute to the motor vehicular crash incidents.

Overall, the STOP-BANG and ESS methods were found to be simple, inexpensive, and easy-to-administer screening techniques in this study. Using these methods as part of medical practice may give important information such as prevalence, risk factors and more on the scale of the OSA cases in population that needs medical attention, thereby possibly leading to early detection, intervention and treatment of the said sleeping disorder.¹³ Additional studies that are specifically designed for the general population are needed for validation purposes.¹¹

Conclusions

This investigation was conducted to estimate the prevalence of OSA among persons attending the 5 PHCCs and the Family Medicine Department at IMC in Jeddah, Saudi Arabia. The result of STOP-BANG and ESS analysis showed that the majority of the adult subjects were at low risk of acquiring OSA and experienced less daytime

sleepiness. This suggests that the screened population may not further undergo an objective OSA diagnostic testing.

Factors such as age (> 50 years old), male gender, hypertension and BMI (>35) were discovered to be ominously related with OSA based on Mann-Whitney test. This suggests that the adult subjects under study, possessing such determinants, were significantly at more risk of acquiring OSA.

Easy-to-administer screening techniques, STOP-BANG and ESS, were found to be important and useful in assessing the prevalence of high risk subjects for OSA and may facilitate early diagnosis and treatment of the said clinical condition, thereby reducing the possible economic-related burden, health and psychological consequences. Further validation of these tests by PSG is required.

Limitations

Because some of the asked sleep-related characteristics were based on self-assessment, a companion who knows the sleeping behavior of the patients under study must be present in accomplishing some parts of the screening tests.

Recommendations

1. More population-based studies may be conducted to assess the prevalence of OSA and its determinants in Kingdom of Saudi Arabia.
2. Subjects who will be known to have moderate to high risk to acquire OSA based on the screening questionnaires may subsequently go through objective sleep examination in order to complete the analysis and to confirm the diagnosis of OSA.

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Conflict of Interest: None.

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