

Review Article

Awareness and understanding of obstructive sleep apnea in Panyanantphikkhu Chonprathan Medical Center

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Abstract

Awareness of Obstructive sleep apnea (OSA) is increasing worldwide. OSA diagnoses are observed when patients report their sleep problems to their general practitioners. Therefore, the greater the awareness and understanding of OSA in the general population, the more OSA can be detected, to prevent serious consequences of untreated OSA. A cross-sectional study was conducted on 281 cases of population surveyed at Panyanantphikkhu Chonprathan Medical Center. A statistical analysis of the relationships in the data was pursued. OSA awareness was 81.1%, with the 40-59 year group having the most significant awareness. The perception of OSA symptoms ranged within 55.7-72.7% for sleep apnea, snoring, and daytime sleepiness, while lesser-known symptoms including hypopnea, sudden awakening, choking and gasping for air during sleep was correctly perceived by only 35.2-47.7%. The diseases of reflux, tonsillar hypertrophy, asthma, neurological diseases, and habitual smoking and drinking behaviors, were recognized as possible causes of OSA in only 25-33% of cases. The awareness of OSA can be increased by introducing additional information about lesser-known symptoms of OSA and the diseases associated with OSA to the general public. The recommended main target population is aged 40 – 59 years and of the female gender.

Keywords: obstructive sleep apnea, awareness, understanding, PCMC, OSA

1. Introduction

Obstructive sleep apnea (OSA) is known to be one of the leading causes of cardiovascular diseases (Kent *et al.*, 2013; Mooe, Franklin, Holmström, Rabben, & Wiklund, 2001; Shahar *et al.*, 2001), neurovascular diseases (Arzt, Young, Finn, Skatrud, & Bradley, 2005; Lajoie, Lafontaine, Kimoff, & Kaminska, 2020; Munoz *et al.*, 2006; Redline *et al.*, 2010; Yaggi *et al.*, 2005), and increased mortality (Punjabi *et al.*, 2009). The significant decrease in quality of life for the population with OSA and their bed partners aroused more awareness of the disease, but not enough to actively seek consultations from specialists.

Literature on the prevalence of OSA around the world showed approximately 24% in males (14%-49% in middle-

aged men) (Garvey, Pengo, Drakatos, & Kent, 2015) and 9% in female population aged 30 – 60 years old (Young *et al.*, 1993) and has an increasing tendency with advancing of the age (Kapur, 2010). Approximately 80–90% of OSA cases remain undiagnosed (Chen *et al.*, 2021), but specialist referrals and OSA diagnoses increase as patients report their sleep problems to their general practitioners (Williams *et al.*, 2015). Therefore, the more the awareness and understanding of OSA in the general population, the more latent OSA can be detected (Jehan *et al.*, 2017), to prevent the potentially serious consequences of untreated OSA.

A study in the Singaporean population showed 21.5% awareness of OSA, but only 13% of the group was able to correctly define OSA (Sia *et al.*, 2017). We have observed that many patients who visited Ear-Nose-Throat clinic at Panyanantphikkhu Chonprathan Medical Center (PCMC), a tertiary care hospital, regard loud snoring as their norm of sleep pattern in the family and don't concern themselves with the problems even though their bed partners do. Therefore, we

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study the awareness and understanding of OSA in order to raise awareness of OSA in the general population.

2. Materials and Methods

A cross-sectional study of the awareness and understanding of OSA in the population visiting Ear-Nose-Throat clinic at PCMC who were willing to participate in the survey was conducted. Sample size calculation required 260 participants, using in the estimation an infinite population proportion formula with the mean prevalence of OSA at 21.5% (Ip *et al.*, 2001; Ip *et al.*, 2004; He *et al.*, 2010; Hussain *et al.*, 2014; Puvanendran, & Goh, 1999; Sharma, Kumpawat, Banga, & Goel, 2006). The survey was introduced to visitors at the clinic and participants filled the questionnaire sheet. Questions included part of the STOP-BANG screening for the Thai version of OSA (Banhira, Durongphan, Saleesing, & Chongkolwatana, 2014) and the possible causes of OSA were queried. Data of 260 sampled cases and the spare of 26 (10%) of possibly incomplete data were collected. The total of 281 completed data records were analyzed. Statistical analysis of the data included Pearson Chi-Squares test and Poisson regression model analysis, to assess the relationships in the data. The informed consent and the study questionnaire were reviewed and approved by Panyanantaphikkhu Chonprathan Medical Center, Srinakharinwirot University IRB full board.

Awareness of OSA was surveyed among the participants, who admitted to being familiar with the term OSA, either by having been diagnosed, having relatives or friends being diagnosed or acquiring information of OSA elsewhere. Since there is no validated question regarding knowledge of OSA in Thai, we used the Thai language version of STOP BANG questions that are relevant to the symptoms of OSA as part of the questionnaire to determine the understanding of OSA, providing 7 “yes/no/not sure questions” for snoring, tiredness, and observed apnea; and additional questions regarding symptoms of choking and gasping for air during sleep, sudden awakening from sleep with palpitation, and unrefreshing sleep. Another group of 7 questions regarding underlying diseases or factors associated with the occurrence of OSA including obesity, rhinitis, reflux, tonsillar hypertrophy, asthma, neurological diseases and habitual smoking/drinking behaviors were used to determine the recognition of possible causes of OSA.

Giving 4 or more correct answers was grouped as understanding of OSA whereas giving 4 or more incorrect answers was grouped as misunderstanding of OSA. We used a cut-off point of 4 correct/incorrect answers mainly focusing on the acceptable definitions of OSA including upper airway narrowing, disrupted sleep, breathing difficulties during sleep, poor-rested sleep and daytime somnolence. Answering “not sure and no” means that participants are not sure about the symptoms and possible causes of OSA, Therefore, the researchers can plan on providing comprehensive information about OSA, in order for the population to better understand the condition and seek more treatment.

The study compared different age groups in both genders with body mass index (BMI) categories and recognition of OSA. The BMI was calculated and categorized using Proposed classification of weight and BMI in adult Asians (World Health Organization. Regional Office for the Western Pacific, 2000) into healthy (BMI < 23 kg/m2),

overweight (23 – 24.9 kg/m2), obese I (25 – 29.9 kg/m2) and obese II (>30 kg/m2) categories. No data of participants’ personal history, underlying diseases or sensitive data were collected.

3. Results

The 281 participants consisted of 114 males (40.6%) and 167 females (59.4%) divided into 4 age groups. Each age group in both genders was equally distributed. More than half (59.1%) of the participants were in the adult age group of 40 – 59 years old, followed by retired age group (23.8%), young adult age group (15.3%) and senile age group of 80+ years old (1.8%) as shown in Table 1. The mean and median ages were 50.8 and 48 years old, respectively.

The distribution of BMI categories by age group (Figure 1) showed that the majority of obese II group was adult females (13.8%), followed by young adult females (7.2%) and adult males (6.1%). More than half of the obese I group was found in young adult males (22.8%), young adult females (12%), adult males (10.5%) and adult females (7.8%), respectively. Similar age groups of adults in each gender (female 11.4%, male 7.9%) and young adult males (9.6%) were overweight. Also in the healthy category, adult female and young adult male age groups were the predominant groups of the categories (24% and 17.5% respectively). Considering abnormally high BMI in the study population, adult female age group contributed the majority among obese II, obese I, and overweight categories, whereas young adult males has most abnormally high BMI, followed by adult male age group.

Table 1. Distribution of participants by age group and by gender

Age group (y)	Male		Female		Total	
	n=	%	n=	%	n=	%
	114	40.6	167	59.4	281	100
Young adult group (Group 1) 18 – 39	17	14.9	26	15.6	43	15.3
Adult group (Group 2) 40 – 59	64	56.1	102	61.1	166	59.1
Retired group (Group 3) 60 – 79	30	26.3	37	22.2	67	23.8
Senior group (Group 4) ≥80	3	2.6	2	1.2	5	1.8

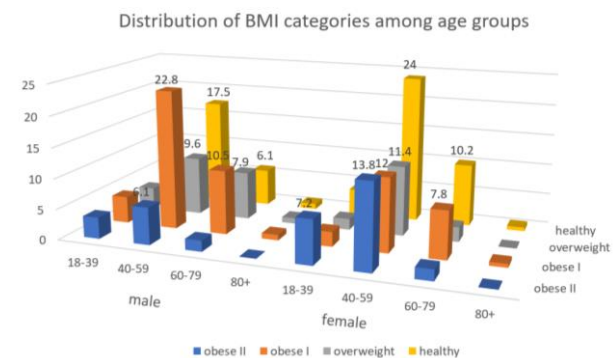


Figure 1. Distribution of BMI categories by age group

Awareness of OSA was determined by the perception of the term Obstructive Sleep Apnea. Overall, 228 of 281 cases (81.1%) had known of OSA, of which 105 cases (37.4%) had been diagnosed, had a relative diagnosed, or had prior information received of OSA. One hundred and twenty-three cases (43.8%) were aware of the term but were unsure of the meaning of OSA, whereas only 53 cases (18.9%) had never been exposed to the term OSA. The relationship of gender, age group, BMI category, and awareness of OSA showed statistically significant differences between age groups and awareness of OSA. The adult age group had the greatest awareness among the age groups ($p < 0.001$) regardless of gender or BMI category (Table 2).

Understanding of OSA showed that 4 of the 7 possible symptoms of OSA were recognized by more than half of participants, including loud snoring (67%), periodic

stop of breathing during sleep (55.7%), unrefreshing sleep (64.8%), and easily feeling tired and having daytime sleepiness (72.7%), while the other three possible symptoms of OSA including periodic shallow breathing during sleep (35.2%), sudden awakening with palpitation (44.5%), and choking and gasping for air during sleep (47.7%), were recognized by less than half of the participants (Figure 2).

Regarding underlying diseases, only obesity (54.5%) and rhinitis (58.6%) were recognized as possible causes of OSA. Reflux, tonsillar hypertrophy, asthma, neurological diseases, and habitual smoking and drinking behaviors were recognized as possible causes of OSA by only 33%, 25%, 29.5%, 25% and 27.3% respectively. Participants' agreement to the necessity of the treatments once OSA was diagnosed were as high as 70.5%.

Table 2. Association between gender, age group, BMI category, and awareness of OSA

Factor	Category	Awareness of OSA		Statistic	p-value
		Yes	No		
		n (%)	n (%)		
Gender	Male	90 (40.6)	24 (44.4)	0.416 ^a	0.519
	Female	137 (60.4)	30 (55.6)		
Age group	Young adult	38 (16.7)	5 (9.3)	19.882 ^a	<0.001*
	Adult	143 (63.0)	23 (42.6)		
	Retired	44 (19.4)	23 (42.6)		
	Senior	2 (0.9)	3 (5.6)		
BMI group	Normal	78(80.4)	19(19.6)	0.099 ^a	0.992
	Overweight	42(82.4)	9(17.6)		
	Obese I	66(80.5)	16(19.5)		
	Obese II	41(80.4)	10(19.6)		

Note: ^a Pearson Chi-Squared test, n is number of samples (frequency) and % is percentage. *Significance

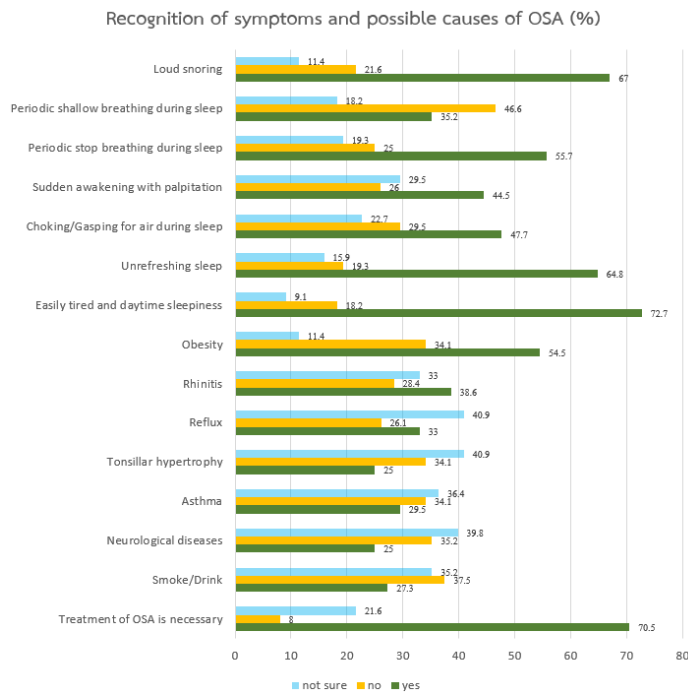


Figure 2. Recognition of symptoms and possible causes of OSA

4. Discussion

Multivariate analysis of the total counts of all incorrect items regarding symptoms of OSA questions showed that subgroups which gave significant incorrect answers were female subgroup (p-value = 0.032) and the adult age (group 2) subgroup (p-value = 0.003) whereas incorrect items regarding possible causes of OSA were not statistically different by subgroup.

Participants who were interested in taking part in this survey study were mainly of age 40 – 59 years (adult age group), followed by age 60 – 79 years (retired age group), which accounted for 82.9% of overall participants. This indicates that people in these 2 age groups may possibly be affected by OSA either directly or indirectly through family or friends, or were interested in seeking information about OSA. Of those in the adult age group, female gender were main participants regardless of BMI categories. This also indicated that female adults may have more concern of OSA symptoms since OSA tends to relate with older age and increased body weight. It is recommended that females aged between 40-59 years old could be the main target population for providing information on OSA.

Awareness of OSA was determined from the responses to having been exposed to the term OSA. Overall awareness in this study was 81.1% which was high compared to 21.5% of awareness among the general population reported in Singapore (Sia *et al.*, 2017). The difference might be because participants of this survey were hospital-based, and the hospital was populated with more sleep apnea cases than in the general population, while the Singapore study was home-based. It showed that the adult age group (63%) was the group with the most significant OSA awareness compared to other age groups. Genders and BMI categories were not different in terms of awareness of OSA (Table 2).

Questions regarding the symptoms of OSA (Figure 2) showed that participants related OSA to being easily tired and having daytime sleepiness, loud snoring, unrefreshing sleep, and periodic stop of breathing during sleep. More than half had misunderstandings (answers of “no” or “not sure” combined) of the symptoms of periodic shallow breathing during sleep, sudden awakening with palpitation, and choking and gasping for air during sleep. The results showed that these three latter symptoms should be emphasized more to increase awareness of OSA, especially regarding the periodic shallow breathing during sleep or hypopnea. The lesser-known symptom of hypopnea was recognized by only 35.2% of participants, whereas hypopnea itself was the main finding of OSA in children diagnosed by polysomnography, rather than apnea found in adults (Gouthro, & Slowik, 2022).

Data analysis of incorrect answers regarding symptoms of OSA showed that the female group (p-value = 0.032) and both male and female adult age group (p-value = 0.003) had significant misunderstandings of the OSA symptoms. Therefore, we suggested that these 2 age groups should be considered target groups for giving more information about OSA, in order to gain more recognition and consultation of OSA (Table 3).

Obesity and rhinitis were two underlying diseases that more than half of the participants correctly correlated as possible causes of OSA. However, there are many evidence-based data showing that other underlying diseases and factors are also associated with the occurrence and increased the risk of OSA such as extraesophageal reflux (Zanation, & Senior, 2005), tonsillar hypertrophy (Moser, & Rajagopal, 1987), asthma (Pawelec-Winiarz, & Brzecka, 2018), neurological diseases (Arzt *et al.*, 2005; Lajoie *et al.* 2020; Munoz *et al.*, 2006; Redline *et al.*, 2010; Yaggi *et al.*, 2005) as well as alcohol consumption (Simou, Britton, & Leonardi-Bee, 2018). Smoking is another factor found to be related to

Table 3. Multivariate analysis of Poisson regression model for total count of all incorrect items

Outcome	Predictors	Category	Multivariate analysis			
			OR	95%CI	p-value	AIC
Questions regarding symptoms of OSA	Gender	Male	1			1162.8
		Female	1.2	1.01to1.37	0.032*	
	Age group	Young adult	1			
		Adult	1.5	1.14to1.86	0.003*	
		Retired	1.1	0.87to1.37	0.452	
		Senior	1.5	0.91to2.6	0.103	
	BMI group	Normal	0.96	0.706 to 1.092	0.242	
		Overweight	1.08	0.814to1.323	0.766	
		Obese I	1.04	0.845to1.320	0.63	
		Obese II	1			
Questions regarding associated factors of OSA	Gender	Male	1			1288.1
		Female	1.13	1.009to1.311	0.036*	
	Age group	Young adult	1			
		Adult	1.14	0.94to1.38	0.176	
		Retired	1.13	0.933to1.336	0.213	
		Senior	1.1	0.877to1.372	0.419	
	BMI group	Normal	1.07	0.912to1.267	0.389	
		Overweight	0.98	0.806to1.183	0.807	
		Obese I	0.97	0.804to1.145	0.649	
		Obese II	1.07	0.912to1.267	0.389	

Note: OR is Odds ratio, 95%CI is 95% confidence interval of odds ratio, and AIC is Akaike's information criterion, *Significance

the severity of OSA (Nieto *et al.*, 2000; Wetter, Young, Bidwell, Badr, & Palta, 1994) in terms of changes in sleep architecture, relaxation of the upper airway muscles, and neural reflexes caused by nicotine (St-Hilaire, *et al.*, 2010), increased arousal threshold from sleep caused by nicotine, and increased upper airway inflammation due to smoke inhalation (Krishnan, Dixon-Williams, & Thornton, 2014). Introducing these underlying diseases and factors to the general population can increase the understanding, thereby raising awareness about OSA, and can also be beneficial to encourage people to reduce the risk of OSA by control of these underlying diseases and factors.

5. Conclusions

Obstructive sleep apnea has become known in the recent years to both the general population and to healthcare providers due to an easier access to information available worldwide. But there is still need for more awareness in the general population, to be gained by distributing intense information. It is recommended to emphasize giving more information on periodic shallow breathing during sleep, sudden awakening with palpitation, and choking and gasping for air during sleep, as well as factors related to OSA including extraesophageal reflux, tonsillar hypertrophy, asthma, neurological diseases, and habitual smoking and drinking behaviors, to the general public, to encourage more patients to seek consultation. The recommended main target population is of the ages 40 – 59 years and of female gender.

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