Medical Science

pISSN 2321–7359; eISSN 2321–7367

Awareness and knowledge of obstructive sleep apnea among the general population in the western region of Saudi Arabia

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To Cite:
Fageeh YA, Basurrah MA, Alzahrani JA, Alzahrani AA, Aljuaid GM, Al-Sulimani AM, Maghrabi NI, Alharthi AH, Alzahrani KT. Awareness and knowledge of obstructive sleep apnea among the general population in the western region of Saudi Arabia. Medical Science 2022; 26: ms566e2661.
doi: https://doi.org/10.54905/disssi/v26i130/ms566e2661

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Peer-Review History
Received: 06 December 2022
Reviewed & Revised: 09/December/2022 to 20/December/2022
Accepted: 22 December 2022
Published: 27 December 2022

Peer-review Method
External peer-review was done through double-blind method.

URL: https://www.discoveryjournals.org/medicalscience

ABSTRACT

Background: Obstructive sleep apnea (OSA) is a common medical condition that causes pauses in breathing during sleep (SDB). It is distinguished by recurring episodes of partial or complete collapse of the upper airways. To assess the level of awareness and knowledge about obstructive sleep apnea OSA among adults in the western region of the Kingdom of Saudi Arabia. *Methodology:* This is cross-sectional observational study was conducted on a random sample of 500 participants from the general population of the western region of Saudi Arabia. It is including all participants over 18 year's old, female and male gender and Saudis and non-Saudis. For data analysis, we will use (SPSS) software version 24. Approval from the local Ethics Committee was obtained. *Results:* The study recruited 500 responses from the general community, 377 of whom were women (75.4%). The majority of participants (57%), were between the ages of 18 and 25, followed by those between the ages of 26 and 35 (17.4%) and 349 (70.2%) had a university education. Total of 403 participants (80.6%) felt that a person requires 7-9 hours of sleep every day. More than half of the participants (54%) stated that the mental benefits of enough sleep were the most significant, followed by the physical benefits (41.2%). *Conclusion:* The level of awareness of Saudi general population about obstructive sleep apnea in this study was poor. Knowledge of obstructive sleep apnea was correlated significantly with gender (p=0.049) and employment in the health industry (p=0.001).

Keywords: Obstructive sleep apnea, Sleep apnea, Sleeping hours, Lack of sleep, Knowledge and awareness, Saudi Arabia.

1. INTRODUCTION

Obstructive sleep-apnea (OSA) is a common medical condition and a type of sleep-disordered breathing (SDB). It is characterized by repeated complete or

partial-episodes collapses of the upper airways. The apnea-hypopnea-index (AHI) is a tool used to classify OSA as mild, moderate or severe based on how many episodes of apneas and/or hypopneas per hour of sleep. OSA can be assessed by polysomnography (PSG) or other sleep monitoring studies (Mirrakhimov et al., 2013). OSA was first identified in 1965. For many years, doctors thought of obstructive sleep apnea (OSA) as a simple, infrequent closure of the upper airway; thus, early treatments focused primarily on removing the obstruction in the airway. Tracheostomy was the only successful treatment for OSA before to the 1980s, which bypassed the obstruction in the upper airway (Bahammam, 2011).

Multiple factors, including obesity, central body fat distribution, neck circumference and craniofacial anatomical abnormalities, are responsible for the pathogenesis of OSA, with an inter-individual variation. During sleep, OSA patients have repeated narrowing or obstruction of the pharyngeal airway. Anatomic-compromise, pharyngeal-dilator muscle-dysfunction, decreased arousal threshold, ventilatory control instability and/or reduced lung volume tethering have been suggested as the pathophysiological mechanisms causing OSA (Sharma et al., 2015). Additionally, over-weight is a significant risk-factor for OSA, as evidenced by reductions in OSA severity with weight loss interventions and the concurrent rise in OSA prevalence as obesity rates have risen (Patil et al., 2019). OSA is most commonly found it is most common in older men, but it can also afflict women and children (Wali et al., 2017).

OSA is widely regarded as the most frequent sleep-related respiratory problem. Young et al., (2013) estimated the prevalence of OSA in middle-aged, working adults in the Wisconsin Cohort Study in 1994 and they discovered that moderate-to-severe OSA occurred at rates ranging from 3.7% to 4.4% in women. Rates were two to three times higher among men, ranging from 6.2% to 11%. It is estimated that the prevalence of OSA among commercial truck drivers is significantly higher than in the general population. This increased prevalence is generally attributed to three major OSA risk factors that are common among commercial drivers; the majority is male, obese and middle-aged. OSA prevalence in studies of commercial-truck-drivers, the percentage ranged from 28 percent to 78 percent (Gurubhagavatula et al., 2017).

In Saudi Arabia, three out of every 10 Saudi mid-age males and 4 from every 10 Saudi mid-age female are at significant risk of OSA. Furthermore Bahammam, (2011) found that 56 percent of Saudi-patients admitted to CCU with acute coronary syndrome had OSA with an apnea-hypo-apnea index greater than 10/hour. There are many management options for OSA patients, such as lifestyle modifications, losing weight and positive pressure therapies, including bi-level positive airway pressure, continuous-positive-airway-pressure (CPAP) and auto-titrating positive airway pressure. CPAP is so effective that it is the first line in managing OSA. Also, CPAP showed that it not only improves the quality of life and sleep but also decreases blood pressure, strokes and dysrhythmia rates. Patients who can't tolerate CPAP may use oral appliance therapy as an alternative. There are two oral appliance therapies: Mandibular advancement devices, which are preferred and tongue retaining devices. Also, there are different surgeries that aim to correct any anatomical abnormalities causing any obstruction. These involve nasal, oral, hypopharyngeal and laryngeal procedures. Bariatric surgery can benefit obese patients with OSA (Laratta et al., 2017).

In 2019, research has been published in Saudi Arabia in the Asir region to" assess the knowledge and awareness of OSA among the general population" and the result illustrated a low level of awareness about all aspects of OSA (Alshehri et al., 2020). Another study was done in France and showed hopeful results concerning OSA symptoms, but despite that, the general population had limited awareness regarding its complications (Arous et al., 2017). One study was conducted in Singapore in 2017 and reported that 21.5% of participants were aware of OSA but only 13% could correctly define OSA (Tan et al., 2017). In Saudi Arabia, dental interns illustrated limited knowledge about obstructive sleep apnea syndrome (Alansari and Kaki, 2020). There is a lack of understanding among health professionals about the pathophysiology of OSA in Pakistan (Sohail et al., 2020).

Obstructive-sleep-apnea is a chronic morbid condition and many patients don't know how much this disease can affect their quality of life. There has been little research that analyzes the general population's understanding and awareness of OSA in Saudi Arabia's western province. The goal of this research was to evaluate the degree of awareness and understanding regarding OSA among adults in the KSA.

2. METHODOLOGY

A cross-sectional observational study was conducted from Aug 2021 to October 2022 on a random sample of 500 participants from the general population of the western region of Saudi Arabia.

Sample size

The sample size was estimated using the Raosoft calculator. In the kingdom of Saudi Arabia, there were 31,962,983 man and women living in Saudi Arabia in 2020. Based on a 5% margin error with a 99-percentage level of confidence, a minimum sample size of 384 is required

The Sample size was estimated using the formula: n= P (1-P) * $Z\alpha^2$ / d^2 with a 95-percentage level of confidence.

n: Calculated sample size

Z: The z-value for the selected level of confidence (1- a) = 1.96.

P: An estimated prevalence of knowledge

Q: (1 – 0.50) = 50%, i.e., 0.50

D: The maximum acceptable error = 0.05.

So, the calculated minimum sample size was:

$n = (1.96)^2 \times 0.50 \times 0.50 / (0.05)^2 = 384$.

It is including all participants over 18years old, female and male gender and Saudis and non-Saudis. We exclude any participants < 18 years old or from other regions of Saudi Arabia.

An online questionnaire will be administrated over a period of 20 days and distributed through social media like WhatsApp, Telegram, Snap chat and Twitter. The questionnaire is valid and used in a previous study that was published (Alshehri et al., 2020). This questionnaire contains questions regarding socio-demographic data and sleep-related questions.

Analyzes and entry method

All data in this study was collected by using Statistical Package for Social Sciences (SPSS 22.0) for Windows (IBM SPSS Statistics for Windows, v22.0 Armonk, NY: IBM Corp) to be statistically analyzed data. Categorical variables such as socio-demographic and professional characteristics of the participants were presented as percentages and frequencies and were shown as Mean ± Standard Deviation.

3. RESULTS

Table 1 show the total number of participants was 500, 377 of them were females (75.4%). The majority of the participants were between the ages of 18-25 (57%), followed by participants between the ages of 26-35 (17.4%) and 349 (70.2%) of the participants, had a university educational level. The majority of the participants, 245 (49%) were students of the total participants, 339 (67.8%) did not work in the health sector and 161 (32.2%) worked in the health sector. Most of the participants, 343 (68.6%) reside in Taif, followed by 73 participants (14.6%) residing in Mecca.

Table 1 Socio-demographic characteristics of participants (n=500)

Parameter		No.	%
Gender	Male	123	24.6
	Female	377	75.4
Age	18-25	285	57.0
	26-35	87	17.4
	36-45	77	15.4
	>45 years	51	10.2
Educational level	Uneducated	4	.8
	Basic education	25	5.0
	High school education	122	24.4
	University or more	349	70.2
Social status	Married	184	36.8
	Single	316	63.2
Occupation	Student	245	49.0
	Unemployed	122	24.4
	Employed	13	2.6
	Retired	120	24.0
Work in the Health sector	Yes	161	32.2

	No	339	67.8
Residence	Taif	343	68.6
	Jeddah	61	12.2
	Mecca	73	14.6
	Madinah	4	.8
	Laith	3	.6
	Rabigh	4	3.2

Table 2 shows participants' knowledge of sleep and its associated factors. More than half of the participants (54%) believed the mental benefits are the most important to get from adequate sleep followed by the physical benefits (41.2%), almost all participants (96.8%) did believe that a lack of sleep had an impact on their work (59.4%) of participants reported knowledge of a relationship between sleep and aging. In addition (70.4 %) were aware that naps during the day affect sleep at night, (51%) reported that sports activities improve the quality of sleep and (53%) believed psychological stress is a cause of disrupted sleep.

Table 2 Participant's knowledge of sleep and its associated factors (n=500)

Parameter		N	%
The most important benefit of adequate sleep	Mental benefits	270	54.0
	Physical benefits	206	41.2
	Social benefits	20	4.0
	Psychological benefits	4	.8
Lack of sleep affects work	Yes	484	96.8
	No	16	3.2
Napping during the day affects sleep in the evening	Yes	352	70.4
	No	148	29.6
There is a relationship between sleep and aging	Yes	297	59.4
	No	57	11.4
	Don't know	146	29.2
Which of the following may improve sleep	Phone use	40	4.9
	Watching TV	45	5.5
	Use of medicines	48	5.9
	sports activities	414	51.0
	Lack of eating	191	23.6
	Eating a lot	26	3.2
	Don't know	47	5.8
Which of the following might disturb sleep	Sports activities	30	3.7
	lack of eating	55	6.8
	Eating a lot	42	5.2
	Psychological stressors	430	53.2
	Drink coffee and tea	200	24.7
	Pain and health problems	22	2.7
	I do not know	30	3.7

Figure 1 illustrates almost half the participants 403 of the participants (80.6%) believed a person needs 7-9 sleeping hours per day. Only about (6.4%) of participants stated they need more than 9 sleeping hours.

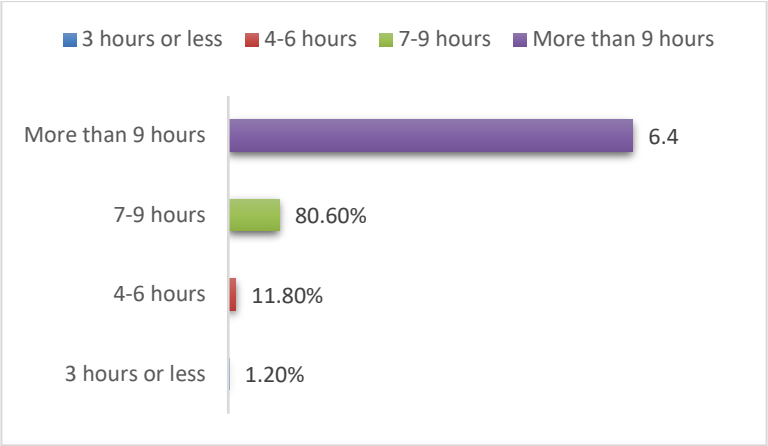

Figure 1 Comorbidities and sleep characteristics among participants (n=500)

As in Table 3 out of all participants 302 (60.4%) heard of sleep apnea and 362 (72.4%) thought that Sleep apnea is considered dangerous. 188 (30.6%) thought snoring is a symptom of sleep apnea and 177 (23.5%) believed that obesity is the cause of sleep apnea. Most of the participants 430 (86%) didn't know the methods of diagnosing sleep apnea, 442 (88.4%) didn't know management options for sleep apnea and 378 (75.6%) thought that sleep diagnosis and therapy of sleep apnea is important. 196 (26.1%) got their information from social media. Only (15%) of the participants were diagnosed with sleep apnea and (60%) of them felt it affected their quality of life.

Table 3 Participant's knowledge of sleep apnea and its associated factors (n=500)

		Parameter	n
Heard of sleep apnea	Yes	302	60.4
	No	198	39.6
Sleep apnea is considered dangerous	Yes	362	72.4
	No	16	3.2
	Don't know	122	24.4
Causes of sleep apnea	Congenital defects in the respiratory tract	145	19.3
	Smoking	132	17.5
	Facial injuries	152	20.2
	Obesity	177	23.5
	Chronic diseases	125	16.6
	Don't know	22	2.9
Know methods of diagnosing sleep apnea	Yes	70	14.0
	No	430	86.0
Know management of sleep apnea	Yes	58	11.6
	No	442	88.4
Diagnosis and treatment of sleep apnea are important	Yes	378	75.6
	No	14	2.8
	May be	108	21.6
Source of information about sleep apnea	Relatives and friends	104	13.8
	The doctor	188	25.0
	Social media	196	26.1
	The media	127	16.9
	Not interested	114	15.2
	Other	23	3.1
Diagnosed with sleep apnea	Yes	15	3.0
	No	485	97.0

If yes, sleep apnea affected quality of life	Yes	9	60.0
	No	6	40.0

Figure 2 illustrates most of the participants (30.6%) reported snoring as sleep apnea symptom and about 3.3% of the participants chose don't know about sleep apnea symptoms. The association between participants' knowledge of sleep apnea and the socio-demographic characteristics of participants, significant factors were gender (p=0.049) and working in health sector (p= 0.001) (Table 4).

Table 4 Association between participant's knowledge of sleep apnea and socio-demographic characters of participants

		Heard of sleep apnea		P-value
		Yes	No	
Gender	Male	65	58	0.049
		21.5%	29.3%	
	Female	237	140	
		78.5%	70.7%	
Age	18-25	168	117	0.587
		55.6%	59.1%	
	26-35	51	36	
		16.9%	18.2%	
	36-45	48	29	
		15.9%	14.6%	
Educational level	Uneducated	2	2	0.552
		0.7%	1.0%	
	Basic education	15	10	
		5.0%	5.1%	
	High school education	73	49	
		24.2%	24.7%	
	University or more	112	137	
		70.2%	69.2%	
Marital status	Married	190	126	0.870
		62.9%	63.6%	
	Single	112	72	
		37.1%	36.4%	
Occupation	Student	149	96	0.237
		49.3%	48.5%	
	Unemployed	77	43	
		25.5%	21.7%	
	Employed	66	56	
		21.9%	28.3%	
	Retired	10	3	
		3.3%	1.5%	
Work in the health sector	Yes	118	43	0.001
		39.1%	21.7%	
	No	184	155	
		60.9%	78.3%	

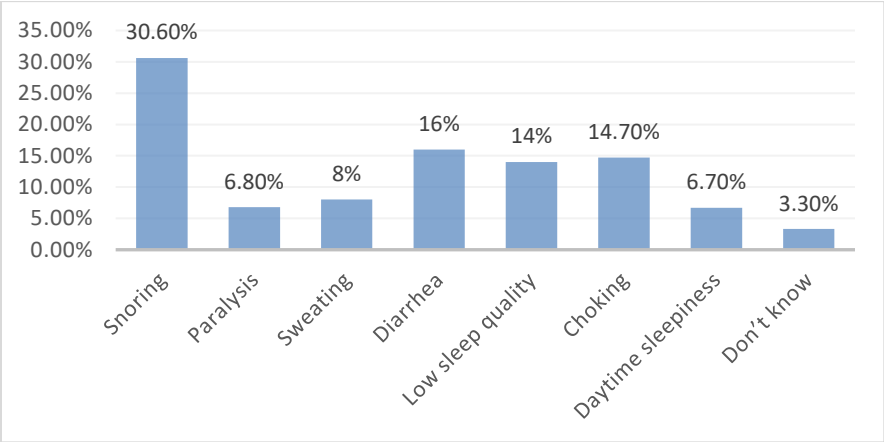

Figure 2 Participant's knowledge of sleep apnea symptom's

4. DISCUSSION

Disrupted sleep the illness known as OSA apnea causes the upper airway to repeatedly close off when a person is sleeping, which causes oxygen desaturation and disordered sleep. Snoring, observed apneas and drowsiness are characteristics. Variable pathogenesis; risk factors include low arousal threshold, small-lung capacity, small upper airway aperture, instability respiratory control and malfunctioning airway obstruction dilator muscles (Jordan et al., 2014). This is an observational cross-sectional study conducted on a random sample of 500 participants from the general population of the western-region of Saudi Arabia. The study aims to assess the level of awareness & knowledge of obstructive-sleep-apnea among the general population.

According to participant's knowledge of sleep apnea, our study found that more than half of participants (60.4%) heard of sleep apnea and the majority 72.4% thought that sleep apnea is considered dangerous. Only 14% of cases know methods of diagnosing sleep apnea, 11.6% know the management options of sleep apnea but, the majority 75.6% said that sleep diagnosis and therapy apnea are important. Study was conducted targeting 1,000 of the Saudi general population and reported that the overall knowledge level was poor for 80.7% of the total sample and good for 19.3% with a mean score of 24.8%; the knowledge level for methods of treatment was 26% followed by risk factors by 24.5% and complications knowledge by a mean score of 20.9% (Shehata et al., 2019).

Another study conducted in the Asir region of Saudi Arabia with 626 participants found that 64% were aware of OSA, compared to 36% who were not; nearly all respondents reported that OSA was dangerous; 24% did not know whether OSA was dangerous; furthermore, 81 percent of contributors described that they were unaware of the methods for diagnosing OSA; 84% were unaware of the methods for treating OSA; however, 80% of respondents stated that the treatment and diagnosis of sleep apnea are crucial (Alshehri et al., 2020). In Jeddah, another study was conducted among 352 dental practitioners; most respondents (80.6%) revealed that they had previous knowledge of OSA in the self-assessment question, in the total knowledge assessment part of the questionnaire, the mean total knowledge-score (9.86) was below the cutoff of 12 and 65.58% of respondents scored below 60%, showing that they had little awareness of OSA (Alzahrani et al., 2022).

In Singapore, a population-based study carried out among 1306 participants revealed only (13.0%) of respondents correctly defined OSA and only (5.9%), (12.1%), (11.5%) and (8.4%) of respondents correctly listed at least one risk-factor, symptom, health consequence and treatment option for OSA, respectively. This suggests that OSA awareness and knowledge among the general population are currently low. In a cross-sectional analytical study conducted in Turkey, 1651 patients and patient relatives who applied to the outpatient clinics at Konya Research and Training Hospital were included. Of the participants, 61% had never heard of OSAS; however, only 39% thought they knew enough about the condition. A total of 37.3%, 54.3% and 8.4% of individuals had low knowledge, medium knowledge and strong knowledge, respectively (Yılmaz et al., 2019). Another study in Nigeria displayed that there-was a low level regarding the awareness and reporting symptoms of OSA (Desalu et al., 2016). In Canada, most of people were aware of the severity of the risk factors and symptoms of sleep apnea (Walker et al., 2010).

Unaccounted for daytime-sleepiness, rest-less sleep and loud-snoring punctuated by gasps are all indications of OSA. Less-common symptoms are morning-headaches; insomnia; trouble-concentrating; mood-changes such as anxiety and depression; forget-fullness; increased heart-rate and/or blood-pressure; decreased-sex-drive; unexplained weight-gain; and increased urination and/or nocturia and heavy night-sweats. Regarding knowledge of participants about symptoms of sleep apnea, our study reported; third of cases (30.6%) said snoring followed by 16% for diarrhea, 14.7% for choking, 14% for low sleep quality, 8% sweating, 6.8% paralysis, 6.7% reported daytime sleepiness and only 3.3% of participants don't know symptoms of sleep apnea.

In Saudi Arabia, results from another study showed that the highest knowledge level was for disease symptoms knowledge by 28% (Shehata et al., 2019). Another study found that when participants were asked about symptoms that could be brought on by sleep apnea, 44% of them reported daytime sleepiness and 59.4% reported feeling tired when they woke up in the morning, 71.4% snoring, and 66.9% respiratory arrest during sleep, among the symptoms, the most noticeable symptom was "shivering in hands" (83.5%), which is a distracter. The most familiar symptom among the symptoms was snoring (71.4%) and the least common symptom (10.4%) was the decrease in sexual desire (Yılmaz et al., 2019). Another study in France Arous et al., (2017), showed that more than 75% knew the main symptoms like respiratory breaks during sleep, daytime fatigue and non-restorative sleep, while other signs such as nocturia and morning headache were less well-known.

Regarding knowledge about the reasons of sleep-apnea, our study found that 23.5% of participants reported obesity as a cause of sleep apnea followed by facial injuries 20.2%, congenital defects in the respiratory tract 19.3%, smoking 17.5%, chronic disease 16.6% and only 2.9% didn't know the reasons of sleep-apnea. In contrast to our findings results from another study demonstrated that participants definite the reasons for sleep apnea as smoking (53.1%), alcohol (36.1%), curved nasal bone (56.4%), hypertrophic tonsils (37.6%), thick neck (10.1%), adenoid hypertrophy (57.4%), a large tongue (22.4%), goiter (27.3%), small jaw (4.1%) and obesity (55.2%). Adenoid hypertrophy (57.36%) had the highest rate and small jaw (4.06%) had the least rate between correct answers (Yılmaz et al., 2019). As regards the source of information regarding sleep-apnea we found that 26.1% of participants reported social-media as a foundation of info about sleep-apnea followed by a quarter (25%) of them reported the doctors, 16.9% the media, 13.8% relatives and friends and 15.2% were not interested. Another study reported; It was clear that the highest percentage (11.8%) of the respondents reported the internet, followed by one of the health workers (10%), social media (9.5%), parents, relatives and friends (8.6%), studying (5.6%), doctors (1.1%) and from patients with OSA (0.5%), while 52.9% have no information about the disease (Shehata et al., 2019). However, in Asir region, another study found that (26%) of respondents seek clinicians for info, while (23%) seek it from social-media (Alshehri et al., 2020). Results from another study showed that the most common sources of information about OSA were traditional media such as newspapers (42.0%), the internet (14.2%) or relatives and friends (14.6%). In Turkey, another study reported social-media accounted for 56.5percent of the respondents' data sources, while health-workers made up the least amount, at 19.8% (Yılmaz et al., 2019).

Obstructive-sleep-apnea (OSA) is considered a global health issue because of its high prevalence in the general population. It is a common condition worldwide including in Saudi Arabia, where the prevalence is reported to be around 12% in men and 5% in women (Shehata et al., 2019). In accordance with this, our study found that 3% of participants were diagnosed with sleep apnea and it affected the quality of life in 60% of them. In a population-based regional survey across Saudi Arabia, Haq et al., (2021) found that OSA prevalence among men was 4%, whereas the prevalence among women was 1.8%. The occurrence of OSA in the United-States was estimated to be 3% to7% in males and 2% to 5% in females (Peppard et al., 2013; Punjabi, 2008). According to a recent Swiss study, the occurrence of mod-to-severe (OSA) in adult females is 23.4% and 49.7% in adult males (Chen et al., 2020). As regards the association between participants' knowledge of sleep apnea and socio-demographic characters of participants our finding shows an association between participants' knowledge of sleep apnea and socio-demographic characters of participants. Significant factors were gender (p=0.049) and working in health sector (p= 0.001). Females had good knowledge about sleep apnea 78.5% more than males 21.5%. Young age subjects (18-25 years old) are more aware of sleep apnea than others. However, results from another study found that males had the highest good level of knowledge regarding OSA with 23.5% of the total males, while females had the highest poor level of knowledge regarding OSA with 83.4% of the total females and similar to our results young-aged population showed four times more awareness regarding OSA compared with old age group (p =0.004) (Shehata et al., 2019). Another study reported that the proportion among women knowledge score was significantly greater than the male's ($p = 0.005$) and persons above the thirty-year-old mark had much more knowledge than individuals who were younger than of 29 ($p = 0.010$) also, levels of knowledge of those with high school degrees or more were greater than those with lower education levels is a middle school or lower ($p< 0.001$) (Yılmaz et al., 2019).

5. CONCLUSION

The general population's awareness and knowledge of obstructive sleep-apnea in Saudi Arabia's western region in this study was poor. There was a significant correlation between knowledge of obstructive sleep-apnea with gender (p=0.049) and working in health sector (p= 0.001).

Recommendations

We recommend that further educational campaigns should be inaugurated to raise awareness and knowledge about obstructive sleep apnea in the western region of Saudi Arabia.

Ethical approval

The research proposal was approved by the Regional Research and Ethics committee of Taif University, southern Saudi Arabia, with letter number (43-166).

Funding

This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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