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Review Article

Importance of Primary Care Providers Awareness about Obstructive Sleep Apnea

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Abstract: ***Background:*** Obstructive Sleep Apnea (OSA) is the primary type of sleep disorder that presents several clinical disorders. These disorders vary from simple complaints such as fatigue and lack of concentration. Some other complaints could be worse and more serious such as personality changes and heart diseases. Nevertheless, it is generally undetected, posing a significant burden on society. The most often used confirmative tool to identify patients suffering from OSA is Polysomnography (PSG), whereas its favorable treatment method is Continuous Positive Airway Pressure (CPAP). However, not every patient has access to a sleep center for detection nor has the money to own a CPAP machine. Primary health care professionals play an essential role in identifying those patients who suffer from OSA due to their first contact with patients in primary health care settings. Objective: The focus of this review paper is providing an overview of obstructive sleep apnea, OSA detection, treatment approaches, and most of all, the role of primary health care professionals in detecting, treating, or referring OSA patients. Methodology: Google Scholar search was used for articles selection using the keywords obstructive sleep apnea, OSA evaluation, diagnosis, and management. Another search was about the societal and economic burden of OSA. Also, the search comprised of the role of primary health care professionals on detection and management of OSA. Conclusion: primary health care providers play a significant role in detecting and treating OSA. They are the first contact that patients go to when sick. The high cost of detecting and treating obstructive sleep apnea may further contribute to late detection, complications deterioration, and decreasing referral and follow-ups. Increasing awareness of the primary health care providers would help to avoid such consequences. OSA remains a public health condition that requires more attention, identification, and more directed research.

Keywords: Obstructive sleep apnea, diagnosis, risk factors and treatment, societal and economic burden, and finally, primary health care professionals' roles.

INTRODUCTION

Sleep disorders are conditions that are known to affect the quality and quantity of sleep. They are associated with increased morbidity and mortality, lower quality of life, and decreased physical and mental performances (Al-Qattan *et al*., 2021). One of the most widespread and prevalent sleep disorder types is obstructive sleep apnea (OSA) (Mayo Clinic, 2021). Lajoie and colleagues described OSA as a curable respiratory sleep condition with either an intermittent partial (hypopnea) or complete (Apnea) obstruction of the upper airway while sleeping. Such a phenomenon results in recurrent oxygen insufficiency to reach the tissues (hypoxia) and a broken sleep pattern (2020). Chang and colleagues (2019) also stated that generally, the upper airway collapses, whether partially (hypopnea) or near-complete cessation (Apnea), for about 10 seconds during each episode.

Morsy and colleagues (2019) described OSA as a medical condition manifested by recurrent partial or total airway obstructions episodes. These recurrent episodes cause desaturation in normal blood oxygen levels during sleep. Consequently, brief awakenings from sleep usually bring this condition to an end. These breathing disruptions reduce oxygen to be carried to the brain, thus causing the accumulation of carbon dioxide. As a result, the brain stimulates the arousal mechanism to allow the airways to reopen for a short period. This phenomenon is performed repeatedly, which deprives the patients of sufficient sleep (Morsy *et al.*).

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The severity of OSA, according to Chang and colleagues, is measured by the apnea-hypopnea index (AHI), which is a standard metric that measures the number of apneas or hypopneas that take place throughout sleep divided by the number of hours slept. They stated that the American Academy of Sleep Medicine (AASM) classified mild OSA severity as (5-15 events per hour), while moderate OSA as (>15-30 events per hour), and severe OSA as (>30 events per hour). According to the researchers, the symptom traditionally associated with OSA is excessive daytime drowsiness which is only present in 40 to 58 percent of cases. On the other hand, 33 to 54 percent have insomnia symptoms, and about 25% are asymptomatic (Donovan *et al.*, 2020).

According to Benjafield and colleagues, approximately 1 billion adults between 30 and 69 worldwide have OSA, with 425 million having a moderate-severe condition (apnea-hypopnea index 15 events/h). Chang and colleagues also stated that OSA prevalence in middle-aged adults in the United States is 10% for mild, and 3.8% and 6.5% for moderate to severe (2019).

According to a recent Swiss study, the prevalence of moderate-to-severe OSA in adult females is 23.4% and 49.7% in adult males (Heinzer *et al*., 2015). Furthermore, a review study that comprised 11 population-based studies published between 1993 and 2013 in various countries globally, such as the United States, estimated the prevalence of OSA to be 17% in women and 22% in men (Heinzer *et al*.).

OSA is a significant public health concern in developing countries, with approximately 3% to 7% of males and 2% to 5% of females suffering from the disease (Devaraj, 2020). In a population-based regional survey across Saudi Arabia, Haq and colleagues found that OSA prevalence among men was 4%, whereas the prevalence among women was 1.8% (2021). Wali and colleagues (2017) conducted a study in Saudi Arabia to determine the prevalence and risk factors of OSA. After screening a sample of (n=2682), 346 individuals were selected to use PSG. A total of 235 (67.9%) of the 346 subjects who underwent PSG had OSA with an AHI of 5. Of those 235 subjects, 76(22.0%) suffered OSA syndrome (OSAS), characterized as an AHI of 5 with daytime drowsiness. Of a total of 235 people, 227 (65.6 percent) had clinically diagnosed OSA syndrome (COSAS) based on the guidelines by the American Academy of Sleep Medicine (AASM).

Adverse Effects of OSA

OSA is rarely life-threatening; however, it can lead to high blood pressure, metabolic and cardiovascular diseases if left untreated. Ischemic heart disease, heart failure, arrhythmias, cerebrovascular diseases, and type II diabetes patients are high-risk populations for OSA (Garvey *et al*., 2015). OSA continues to be a significant cause of morbidity and mortality worldwide, with prevalence estimates varying depending on personal factors such as age, sex, obesity, and ethnicity. Also, the variation in the prevalence depends on the methods and classifications used to diagnose OSA (Senaratna *et al*., 2017 & Heinzer *et al*.).

OSA causes several risk factors, which are categorized as modifiable and non-modifiable. Unmodifiable risk factors include older age, male gender, ethnicity, hereditary, menopause in women, and craniofacial deformities (Luyster *et al*., 2016). On the other hand, obesity, smoking, and alcohol intake are major modifiable risk factors for OSA (Rundo, 2019). Obesity is a severe risk factor for OSA, accounting for more than half of all diagnosed patients. The cause is an enlarged tissue deposit around the neck (Dudley & Patel, 2016). Patients 40 to 70 years of age are at a higher risk of developing OSA (Semelka *et al*., 2016). Al-Qattan and colleagues (2021) conducted cross-sectional research on a sample of a working population (n = 651) in Kuwait to assess OSA prevalence, risk factors, and related disorders based on the Berlin Questionnaire. Overall, 20% of those participants were at high risk for OSA, with more males than females at high risk for it. Furthermore, participants who were older and obese had a higher incidence of OSA. Also, current smoking, more hours spent watching television, and a poor self-perception of physical health increases the incidence of high risk for OSA.

Untreated OSA may cause cognitive dysfunction, poor work productivity, and an increased risk of injury and death in road traffic accidents. Reduced alertness, daytime dozing, performance deficiencies, morning headaches, mood swings, and general malaise are some of the other effects of OSA (Morsy *et al*.). OSA's negative impacts, however, extend beyond the patient's life, affecting his or her family, work performance, and the community as a whole (Luyster *et al*. & Morsy *et al*.). Morsy and colleagues also stated that OSA symptoms might disrupt a patient's sleep quality, thereby impacting his or her significant others. Additionally, the illness may impair a patient's ability to work due to daytime sleepiness since it results in various workplace accidents and injuries (Garbarino *et al*., 2016).

Detection and Treatment Modalities of OSA

Although there is substantial proof of the harmful health consequences of untreated OSA, it remains primarily undiagnosed and, therefore, causes a substantial burden on society. There are other reasons to encourage OSA detection and treatment to reduce the financial and social burden on society, such as advances in technology and the availability of effective treatments (ChaiCoetzer *et al*., 2021, Franklin *et al*., 2015). One of the treatment modalities that could detect and treat OSA is polysomnography (PSG), the gold standard for detecting OSA in adults (Phua *et al*., 2021).

Usually, the PSG is conducted at a sleep clinic at night time while the patient falls asleep. PSG involves monitoring many physiological variables such as electroencephalography, movements of the eyes, and muscle tone. Also, the PSG measures respiratory effort, airflow, and oxygen saturation (Amra *et al*., 2018). According to Polysomnography (PSG) test results, mild OSA, defined as an apnea-hypopnea index [AHI] of 5 to 15, has a prevalence estimate of 9%-38%. In contrast, moderate-to-severe OSA, defined as an AHI of 15, has a prevalence estimate of 6%-17% in the general population (Senaratna *et al*., & Coughlin *et al*., 2020).

Nevertheless, PSG testing of all individuals suspected of having OSA is not realistic due to the high cost and limited accessibility due to the high prevalence of OSA and the high cost of testing. Therefore, numerous questionnaires have been developed to identify high risk for OSA individuals in extensive population-based studies (Devaraj). The Berlin Questionnaire, the STOP questionnaire, the STOP-Bang questionnaire, and the Epworth Sleepiness Scale are examples of surveys with varying degrees of accuracy (Amra & Al-Qattan).

The Berlin Questionnaire (BQ) is a three-part questionnaire created by Netzer in 1999. The first section deals with snoring, the second with daytime exhaustion and sleepiness, and the third with a medical history and anthropometric measurements, including blood pressure and BMI. In order to confirm high-risk patients for OSA, two or more criteria from the BQ have to test positive (Netzer *et al*.). The STOP questionnaire (SQ) has four subjective tests: (S)noring, (T)iredness, (O)bserved Apnea, and High Blood (P)ressure. It is a simple and easy-to-use OSA screening instrument. It has a high sensitivity that confirms individuals have OSA if they answer yes to two or more questions (Chung *et al*., 2008). The STOP-Bang questionnaire (SBQ) includes the four subjective tests from the SQ: Snoring, Tiredness, Observed Apnea, and High Blood Pressure. In addition to the STOP, there are other four demographics items (BANG) added. The BANG is an acronym for (B)MI, (A)ge, (N)eck circumference, and (G)ender. A score of 5–8 in SBQ indicates that the patient is at high risk for OSA (Chung *et al*.). The Epworth Sleepiness Scale (ESS) is an eight-item questionnaire that uses a four-point Likert Scale response format (0–3) with a score range from 0 to 24 to determine daytime sleepiness. An ESS score of 11 or higher and excessive daytime drowsiness indicate a high risk for OSA (Johns, 1991).

Patients with OSA symptoms, such as witnessed Apnea, snoring, difficulty breathing at nighttime, and sleeping during the day for unapparent reasons, should be evaluated for OSA, according to Morsy and colleagues. They also suggested evaluating patients with obesity, heart failure, hypertension, and stroke due to the association of those diseases with OSA. Another study by Sunwoo and colleagues suggested that those screened and determined to be at high risk for OSA should undergo objective sleep testing to rule out the diagnosis and determine the severity of OSA (2018).

OSA Management and treatment vary depending on the severity and complications such as a change in behavior, weight reduction, or medication. Some other OSA patients would require continuous positive airway pressure (CPAP), treatment through oral appliance insertion, or surgical procedures (Chang *et al*.). They also recommend that OSA management for some patients avoid sleep in the supine position to decrease the sleep apnea events from occurring (Chang *et al*.).

Alqahtani and colleagues (2020) suggested that a primary health care professional's management of this disease begins with the risk factors such as making significant lifestyle changes. These lifestyle changes are losing weight, quitting smoking and drinking alcohol, and changing sleeping habits, such as elevating the upper body by 30 degrees and sleeping on a side (Alqahtani *et al*.).

In current situations, the most often utilized treatment for moderate to severe disease is continuous positive airway pressure (CPAP). However, in many nations, particularly in developing countries, the expense of this therapy represents a barrier to treatment. According to Devaraj, a simple CPAP machine costs between $1000 and $1500, making it expensive for most individuals (Devaraj).

Economic Cost of OSA

Although the expenses of OSA are challenging to estimate, it appears to be a considerable economic burden (billions of dollars per year) equivalent to other chronic disorders (Knauert *et al.,* 2015). OSA has an estimated annual economic burden of US$3.5 billion in the United States, according to Ip-Buting and colleagues (2017). The annual average expenses of healthcare use and treatment of medical consequences of OSA exceeded age and sex-matched controls by two to threefold (Ip-Buting *et al*.). Furthermore, excess costs of OSA result from nearly twice heart disease medication and almost three times more hypertensive drugs. There are also 50% more hospital stays, about two and a half times the amount of absenteeism from work, and 20% reductions in job performance (Morsy *et al*.). Morsy and colleagues also mentioned that OSA-related accidents, absenteeism, and overall inefficiency account for a significant amount of any workforce's costs. Examples are worker reimbursement fees, healthcare charges, safety, insurance-related costs, and productivity costs (Morsy *et al*.).

According to Watson (2016), the cost of undiagnosed OSA includes car accidents, workplace accidents, lost productivity and time away from work, as well as health-related costs such as hypertension and diabetes. Annually, 800,000 drivers with OSA are predicted to be involved in motor vehicle accidents in the United States, costing $15.9 million (Garvey *et al*.). Furthermore, the high frequency of OSA-related morbidities and consequences has a substantial economic impact on the healthcare system of any country in the world (Knauert *et al*.).

Role of Primary Health Care Professionals in Detecting OSA

Patients with obstructive sleep apnea symptoms are seen practically by all doctors, regardless of their specializations. A basic understanding of OSA is necessary for identifying patients who need referral and treatment. Primary health care professionals currently play an important role in diagnosing, treating, and recommending OSA patients for further treatment (Alqahtani *et al*.).

The absence of proper understanding of OSA patient identification and follow-up processes is a significant obstacle to an OSA diagnosis (Passamonte, 2015), resulting in high expenditures associated with OSA. Therefore, it is necessary to educate primary health care professionals such as nurse practitioners in adult primary health care settings to ensure that OSA is detected and treated before severe and permanent consequences. The early identification of OSA in an adult primary health care population significantly decreases morbidity and mortality (Spicuzza *et al*., 2015).

Early detection can also reduce the economic effect of OSA on the healthcare system and the country due to diagnostic costs and costs associated with OSA-related diseases (Garvey et al.). Also, educating primary health care professionals such as nurse practitioners on how to use screening instruments and questionnaires to detect OSA, as well as adequate follow-up procedures for OSA patients boosts OSA detection and subsequent sleep study referrals (Elton *et al.,* 2017).

Other reasons for educating primary health care professionals are the long wait times for sleep physician consultations and long wait times for sleep laboratory for polysomnography testing. Those reasons cause significant delays in starting OSA diagnosis and treatment, particularly for patients living in rural or distant areas. For instance, there are two sleep centers in Oman located both in the capital Muscat. Those two centers are in AlMasarrah Hospital (psychiatric hospital) that belongs to the management of the Ministry of Health. The other sleep center is under the management of the Sultan Qaboos University Hospital.

Chai-Coetzer and colleagues recommend that to address the growing societal and economic burden of disease, there needs to be increased interest in developing innovative OSA management models that use ambulatory diagnostic techniques (2021). Another innovative solution for OSA management is home-based channels that respond to the growing societal and economic burden of sickness. Home-based pathways allow health care institutions to balance resources more efficiently to meet patient requirements. Home-based approaches also make maintenance more accessible, allowing non-sleep specialists to assist patients (Donovan *et al*., 2020).

Chai-Coetzer and colleagues suggest involving health care professionals other than sleep physicians as the primary health care providers of care, such as physicians and community-based nurses. In four recently published randomized controlled trials, researchers from Australia and Spain consistently demonstrated that outcomes for patients with OSA managed by primary health care physicians and nurses are comparable to those managed in specialist settings, with significant cost savings (Chai-Coetzer *et al*.).

RECOMMENDATION

In order to overcome these hindering issues, better integration of providers into multidisciplinary models of care, development of clear clinical pathways and defined responsibilities to ease system navigation, and use of technology to facilitate communication and information exchange. There needs to be more research in Oman regarding OSA detection, treatment, and referral. Another recommendation is to educate primary health care providers, especially nurses in primary health care settings, since they are the first to receive patients in primary health care settings.

CONCLUSION

Obstructive sleep apnea (OSA) is a medical issue that goes unnoticed. Sleep is critical to the human body's natural restorative abilities. Inadequate sleep raises the risk of death, accidents (car accidents or workplace accidents), decreases cognition and contributes to heart disease, hypertension, stroke, and diabetes. Obese elderly males make up the great majority of those diagnosed with OSA.

Nurses and other primary health care providers are encouraged to have the proper understanding and awareness of the management and consequences of OSA. Having the appropriate knowledge and understanding of OSA and its consequences would identify patients that show symptoms and risk factors quickly. Primary health care nurses and other health care providers have a crucial opportunity to find cases in the primary health care settings. The significance of identifying these undiagnosed people should not be overlooked.

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