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Obstructive Sleep Apnea and Its Association with Sleep Quality, Daytime Sleepiness, Depression and Attention Span

SUZAILY W[1], ROSDINOM R[1], NURHAZRINA H[1], LEE LT[1], SARA NADIA J[1], RAFIQAH A[1], GOH WH[1], NURALIA AR[1], ABDULLAH SANI M[2]

[1]*Department of Psychiatry, [2]Department of Otorhinolaryngology, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia*

ABSTRAK

Apnea tidur obstruktif (OSA) mempunyai banyak kesan fizikal dan psikososial kepada seseorang individu. Oleh itu, kajian ini bertujuan untuk mengkaji kualiti tidur, tahap mengantuk pada waktu siang, kemurungan dan jangka masa perhatian pada pesakit yang mempunyai OSA. Ini adalah kajian keratan rentas dalam kalangan pesakit yang baru didiagnosis menghidap OSA di sebuah hospital di Malaysia. Data sosiodemografi dan klinikal, "Epworth Sleepiness Scale", "Pittsburgh Sleep Quality Index", "Patient Health Questionnaire" dan "Comprehensive Trail Making Test" digunakan sebagai instrumen. Hasil kajian dianalisis dan dipersembahkan menggunakan pengujian Chi-Square, One-Way ANOVA dan "Independent-Sample T-test". Sebilangan besar responden menunjukkan kualiti tidur yang buruk dan jangka masa perhatian yang rendah. Kira-kira separuh daripada responden mempunyai rasa mengantuk yang berlebihan pada waktu siang. Terdapat hubungan yang signifikan di antara kualiti tidur dan tahap mengantuk pada waktu siang (nilai-p=0.051), tahap mengantuk pada waktu siang dengan kemurungan (nilai-p=0.049) dan keterukan OSA dengan kemurungan (nilai-p=0.026). Mengantuk pada waktu siang dikaitkan dengan status bekerja (nilai-p=0.009) dan status memandu (nilai-p=0.033). Kesimpulannya, kebanyakan pesakit OSA mempunyai kualiti tidur yang buruk, mengantuk pada waktu siang yang berlebihan dan tumpuan yang terganggu. Oleh itu, OSA harus didiagnosis dan dirawat lebih awal, terutama pada pesakit yang masih bekerja dan aktif memandu.

Kata kunci: apnea tidur obstruktif, psikologikal, tidur, tumpuan

Address for correspondence and reprint requests: Associate Professor Dr. Suzaily Wahab. Department of Psychiatry, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia. Tel: +603-9145 5555 ext 6142 Email: suzailywhb@yahoo.com

ABSTRACT

Obstructive sleep apnoea (OSA) has multiple physical and psychosocial effects on individuals. Therefore, this study aims to determine the sleep quality, daytime sleepiness, depression and attention span in patients with OSA. This was a cross-sectional study among patients who were recently diagnosed with OSA in a Malaysian hospital. The socio-demographic and clinical data, Epworth Sleepiness Scale, Pittsburgh Sleep Quality Index, Patients Health Questionnaire and Comprehensive Trail Making Test were used as instruments. Findings were analysed and presented using Chi-Square, One-Way ANOVA and Independent-Sample T-test statistical analyses. Most of the respondents presented with poor sleep quality and impaired attention span. Approximately, half of the respondents had excessive daytime sleepiness. There were significant associations between sleep quality and daytime sleepiness (p-value=0.051), daytime sleepiness with depression (p-value=0.049) and severity of OSA with depression (p-value=0.026). Daytime sleepiness was significantly associated with working status (p-value=0.009) and driving status (p-value=0.033). In conclusion, most patients with OSA had poor sleep quality, excessive daytime sleepiness, and impaired attention span. Hence, OSA should be diagnosed and treated early, particularly in patients who are still working and actively driving.

Keywords: attention, obstructive sleep apnea, psychological, sleep

INTRODUCTION

An estimated 936 million adults aged 30-69 years old have obstructive sleep apnoea (OSA) and about 425 million of them required treatment, based on American Academy of Sleep Medicine (AASM) 2012 and apnea-hypopnea index (AHI) criteria (Benjafield et al. 2019). The number may be higher in elderly population. The high prevalence of OSA could be due to the increasing prevalence of obesity due to current sedentary lifestyle (Benjafield et al. 2019).

OSA is recognised as repetitive pauses in breathing, especially during sleeping and associated with reduction of oxygen saturation. The diagnosis of OSA is done using a polysomnography study which is also known as the sleep study test (Qaseem et al. 2014). There are various parameters which are recorded in this test, such as electrocardiography (ECG), electroencephalography (EEG), electro-oculogram (EOM), pulse oximetry, sleeping position, heart rate, and the contraction of leg muscles. The severity of OSA is defined by AHI, where the cut off of AHI is taken at the score of 5, 15 and 30; where 5 for mild, 15 for moderate and 30 for severe. (Gharibeh & Mehra 2010).

Normally, young adults have a night sleep of approximately seven and a half hours on weekdays and slightly

longer on weekend (Carskadon & Dement 2005). In OSA patient, their sleep pattern and sleep quality can be disrupted via several mechanism. The respiratory disturbance due to OSA will stimulate ventilatory effort and reduce oxygen level within the body, resulting in arousal from sleep that occur repetitively (Somers et al. 2008). This fragmented sleep reduces sleep quality among OSA patient compared to healthy people which was proved by one study among OSA population (Lusic Kalcina et al. 2017). Apart from the sleep fragmentation, OSA also interrupts the pattern of sleep cycles. A normal night involves six sleep cycles with the transition between light sleep and deep sleep (Chami et al. 2010). The severity of OSA is associated with prolong duration of light sleep and reduce duration of deep sleep (Fischer et al. 2012; Pedersen 2019).

The link between OSA and attention has been documented by previous studies. OSA patients have alteration in the hippocampal structures of the brain with focal gray matter volume reduction, leading to impairments in memory, attention, executive functions, and constructional abilities (Canessa et al. 2011). One meta-analysis study showed that psychomotor speed and executive function were affected the most while memory, attention, motor control, construction, and processing abilities speed were less affected (Stranks & Crowe 2015). The cognitive impairments of OSA patient can be either due to sleep-related hypoxemia, or due to fragmented sleep with daytime sleepiness, or can be both (Shpirer et al. 2012).

The association between OSA and depression has also been proven (Schröder & O'Hara 2005; Gupta & Simpson 2015). Some mechanisms may explain the relation between OSA and depression. Poor quality of sleep and hypoxemia may affect mood which can later lead to depression (BaHammam et al. 2016). OSA and depression are also involved with releasing of the same pro-inflammatory cytokines (Kasasbeh et al. 2006; Irwin & Miller 2007). OSA with its associated sleep problem, hypoxemia and obesity, will lead to metabolic and cardiovascular comorbidities (Somers et al. 2008; André et al. 2020), with consequent to having depression (Katon et al. 2007). Despite that, systematic review and meta-analysis showed that there was limited information to conclude the relation between OSA and depression (Edwards et al. 2020).

The aims of this study was to show the relationship between OSA with sleep quality, daytime sleepiness, depression, and attention span. It also shows the relationship between the sleep quality and daytime sleepiness, sleep quality with depression and attention span itself.

MATERIALS AND METHODS

This was a cross-sectional study done among patient from the Ear, Throat and Nose (ENT) clinic and ward in Universiti Kebangsaan Malaysia Medical Center (UKMMC). The duration of this study was 6 months. The research study had been approved by the institution research ethic committee (FF-2015-110). Adult patients (age more than

18 years old) who attended the ENT clinic in UKMMC during the period of study and were recently diagnosed with OSA via polysomnography were included in the study.

Four sets of questionnaires were used, which include the socio-demographic and clinical data, Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI), and Patients Health Questionnaire (PHQ-9). One additional test that was also included was the Comprehensive Trail Making Test (CTMT).

The ESS was developed by Dr Murray Johns and has been used worldwide to assess a person's average level of daytime sleepiness. ESS is an effective self-rating tool to differentiate between a normal average daytime sleepiness and excessive daytime sleepiness that requires medical intervention. Numerous researches using ESS as their study instrument have reported high validity and reliability to measure daytime sleepiness among OSA patient. This questionnaire consists of 8 questions assessing the chances of falling asleep in 8 different situations. The rating ranges from 0-3 with increasing probability of dozing off or falling asleep. The total score would be the sum of the scores from all 8 questions. Scores of more than 10 indicate high level of daytime sleepiness that requires further evaluation and medical attention.

PSQI is a self-administered questionnaire used to assess a person's sleep habits, patterns and quality of the sleep over the last month. It also helps to differentiate between poor and good sleepers. It has also been validated for clinical assessment of various sleep disturbances that may disturb an individual's sleep quality such as OSA. This questionnaire comprises of 19 questions which tested on 7 main domains of sleep difficulties i.e. sleep quality, sleep duration, sleep latency, habitual sleep efficiency, use of sleep medication, sleep disturbances, and daytime dysfunction. The scoring is based on 0-3 Likert Scale with 3 being the most negative extreme of the answer. All the score for the 19 questions were added together to produce a final PSQI score. A score of 5 and above indicate poor sleeper. The validated Malay version of PSQI was highly reliable with internal consistency measured by Cronbach's alpha at 0.74 with test-retest reliability of 0.58 (Farah et al. 2019).

The PHQ is a tool for screening, and to measure the severity of depression. Because of its simplicity, PHQ-9 is very useful in clinical practice and is used to determine the severity of depression. There are several scorings for PHQ-9; 1-4 score categorised as minimal depression, 5-9 as mild depression, 10-14 as moderate depression, 15-19 as moderately severe depression and 20-27 as severe depression.

The CTMT is a screening tool for frontal lobe deficits; psychomotor speed problems, sequencing, visual search, and attention; and set shifting impairments (Gray 2006). It has five sets of visual search and sequencing test in which the numbers or numbers and alphabets are arranged randomly. The time taken to complete this task is recorded, calculated, and converted to T-scores and percentile ranks. It

Table 1: Clinical data of respondents at UKMMC

Clinical Data		Frequency, *n*	Percentage (%)
Body mass index (BMI)	Normal	7	10.8
	Overweight	13	20.0
	Obese	45	69.2
History of ischaemic heart disease	Yes	4	6.2
	No	61	93.8
History of hypertension	Yes	28	43.1
	No	37	56.9
History of diabetes mellitus	Yes	13	20.0
	No	52	80.0
History of hypothyroidism	Yes	1	1.5
	No	64	98.5
Severity of OSA	Mild	14	21.5
	Moderate	18	27.7
	Severe	33	50.8

is suitable for individuals between 5 to 74 years old, and the scores are affected by a change in, concentration, attention, resistance to distraction, and cognitive flexibility which can affect the scoring. The interpretation of the T-scores are as follows: <30 indicates severe impairment, 30-35 indicates mild to moderate impairment, 36-42 indicates below average, 43-57 indicates average, 58-64 indicates high average and >65 indicates superior.

Statistical Analysis

Descriptive analysis based on central tendency distribution (frequency, percentage, mean $\pm$ SD, median (25th, 75th), and range was used to describe the data distribution. Statistical analysis using bivariate analysis was implemented to determine the association between daytime sleepiness, sleep quality, depression, and attention span (dependent variables) with socio-demographic factors of the study (independent variables). Findings were analysed using Chi-Square, One-Way ANOVA, and Independent-Sample T test statistical analyses and were performed with the statistical software SPSS version 22 (IBM Corp., Armonk, NY, USA).

RESULTS

A total of 65 patients with variable degrees of OSA had been recruited in this study. The study revealed that the number of patients with OSA was higher in the 31-50 years age group, with a mean of 44.26. The participants were predominantly male (67.7%) and Malay (72.3%). Among the 65 patients, 84.6% were married, 80% were employed and 87.7% drove.

Based on Table 1, more than half of the participants were obese (69.2%). A total of 6.2% of patients had history of ischaemic heart disease, 43.1%

Table 2: Sleep quality, daytime sleepiness, depression and attention span among study population

Variable		Mean (SD)	Frequency, n	Percentage (%)
Sleep quality	Poor		45	69.2
	Good		20	30.8
Daytime sleepiness	Normal		34	52.3
	Excessive		31	47.7
Depression	Minimal	6.60 (6.24)	33	50.8
	Mild		14	21.5
	Moderate		11	16.9
	Moderately severe		4	6.2
	Severe		3	4.6
Attention span	Very superior		0	0.0
	Superior		1	1.5
	High average		0	0.0
	Average		20	30.8
	Below average		18	27.7
	Mildly to moderately impaired		17	26.2
	Severely impaired		9	13.8

had history of hypertension, 20% of patients had history of diabetes mellitus and 1.5% of patients had history of hypothyroid. At the same time, 50.8% of patients had severe OSA.

Table 2 revealed that the 69.2% of patients had poor sleep quality. In addition to that, 47.7% of patients had excessive daytime sleepiness and 4.6% of patients had severe depression. For the attention span, 40% of the patients had impaired attention span, while 13.8% of them had severely impaired attention span.

From Table 3, sleep quality was further categorised into 7 components which is overall sleep quality, sleep latency, duration of sleep, sleep

Table 3: Components of sleep quality

Components of Sleep Quality	n (%)			
	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty
Overall sleep quality	5 (7.7)	32 (49.2)	23 (35.4)	5 (7.7)
Sleep latency	27 (41.5)	28 (48.1)	7 (10.8)	3 (4.6)
Duration of sleep	12 (18.5)	13 (35.4)	15 (23.1)	15 (23.1)
Sleep efficacy	42 (64.6)	7 (10.8)	0 (0.0)	16 (24.6)
Sleep disturbance	0 (0.0)	38 (58.5)	23 (35.4)	4 (6.2)
Use of hypnotic agent	59 (90.8)	3 (4.6)	0 (0.0)	3 (4.6)
Daytime dysfunction	21 (32.3)	23 (35.4)	15 (23.1)	6 (9.2)

Table 4: Association between socio-demographic and clinical factors with sleep quality, daytime sleepiness, depression and attention span respectively

Subdivision	Sleep quality				Daytime sleepiness				Depression			Attention span		
	Poor	Good	x^2	p-value	Excessive, n (%)	Normal, n (%)	x^2	p-value	Mean PHQ score (SD)	F	p-value	Mean T-score (SD)	Test ANOVA (F) / T test (t)	p-value
Socio-demographic factors														
Age														
15-30 years old	4 (66.7)	2 (33.3)	0.566	0.753	2 (33.3)	4 (66.7)	1.155	0.561	7.17 (4.35)	0.547	0.955	36.67 (9.71)	F = 2.106	0.130
31-50 years old	28 (66.7)	14 (33.3)			22 (52.4)	20 (47.6)			6.71 (6.50)			36.64 (9.07)		
>50 years old	13 (76.5)	4 (23.5)			7 (41.2)	10 (58.8)			6.12 (6.42)			41.82 (9.45)		
Gender														
Male	31 (70.5)	13 (29.5)	0.096	0.757	24 (54.5)	20 (45.5)	2.564	0.109	6.86 (6.21)	0.240	0.626	39.06 (8.98)	t = 1.457	0.150
Female	14 (66.7)	7 (33.3)			7 (33.3)	14 (66.7)			6.05 (6.42)			35.48 (9.94)		
Ethnic group														
Malay	31 (66.0)	16 (34.0)	1.518	0.678	21 (44.7)	26 (55.3)	2.156	0.541	5.85 (6.04)	1.020	0.390	36.09 (9.04)	F = 2.501	0.068
Chinese	9 (81.8)	2 (18.2)			5 (45.5)	6 (54.5)			8.18 (6.44)			44.00 (10.09)		
Indian	4 (66.7)	2 (33.3)			4 (66.7)	2 (23.3)			9.83 (7.46)			40.33 (6.89)		
Others	1 (100.0)	0 (0.0)			1 (100.0)	0 (0.0)			5.00 (0.00)			42.00 (0.00)		

Subdivision	Sleep quality				Daytime sleepiness				Depression			Attention span		
	Poor	Good	x^2	p-value	Excessive, n (%)	Normal, n (%)	x^2	p-value	Mean PHQ score (SD)	F	p-value	Mean T-score (SD)	Test ANOVA (F) / T test (t)	p-value
Marital status														
Single	7 (70.0)	3 (30.0)	0.003	0.954	4 (40.0)	6 (60.0)	0.280	0.596	6.70 (5.01)	0.003	0.957	36.80 (11.39)	t = 0.403	0.688
Married	38 (69.1)	17 (30.9)			27 (49.1)	28 (50.9)			6.58 (6.48)			38.11 (9.07)		
Working status														
Employed	35 (67.3)	17 (32.7)	0.451	0.502	29 (55.8)	23 (44.2)	6.799	0.009	6.63 (6.13)	0.008	0.930	36.62 (9.16)	t = 0.500	0.619
Non-employed	10 (76.9)	3 (23.1)			2 (15.4)	11 (84.6)			6.46 (6.93)			39.08 (10.50)		
Driving status														
Driving	40 (70.2)	17 (29.8)	0.194	0.660	30 (52.6)	27 (47.4)	4.529	0.033	6.65 (6.28)	0.028	0.867	37.98 (8.49)	t = 0.111	0.914
Not-driving	5 (62.5)	3 (37.5)			1 (12.5)	7 (87.5)			6.25 (6.38)			37.38 (15.08)		
Clinical data														
Body mass index (BMI)														
Normal	7 (100.0)	0 (0.0)	4.558	0.102	3 (42.9)	4 (57.1)	0.104	0.949	6.43 (7.09)	1.793	0.175	38.14 (11.35)	F = 10.081	0.346
Overweight	7 (53.8)	6 (46.2)			6 (46.2)	7 (53.8)			3.77 (4.68)			39.77 (5.76)		
Obese	31 (68.9)	14 (31.1)			22 (48.9)	23 (51.1)			7.44 (6.39)			8.56 (1.48)		

Subdivision	Sleep quality				Daytime sleepiness				Depression			Attention span		
	Poor	Good	x^2	p-value	Excessive, n (%)	Normal, n (%)	x^2	p-value	Mean PHQ score (SD)	F	p-value	Mean T-score (SD)	Test ANOVA (F) / T test (t)	p-value
History of ischaemic heart disease														
Yes	3 (75.0)	1 (25.0)	0.067	0.796	3 (75.0)	1 (25.0)	1.274	0.259	9.00 (7.79)	0.626	0.432	36.25 (10.44)	t = 0.362	0.718
No	42 (68.9)	19 (31.1)			28 (45.9)	33 (54.1)			6.44 (6.18)			38.02 (9.39)		
History of hypertension														
Yes	21 (75.0)	7 (25.0)	0.769	0.381	13 (46.4)	15 (53.6)	0.310	0.589	6.46 (5.83)	0.023	0.880	40.39 (10.00)	t = 1.896	0.063
No	24 (64.9)	13 (35.1)			18 (48.6)	19 (51.4)			6.70 (6.62)			36.03 (8.53)		
History of diabetes mellitus														
Yes	10 (76.9)	3 (23.1)	0.451	0.502	7 (53.8)	6 (46.2)	0.247	0.619	6.92 (4.48)	0.043	0.837	37.31 (9.48)	t = 0.256	0.799
No	35 (67.3)	17 (32.7)			24 (46.2)	28 (53.8)			6.52 (6.65)			38.06 (9.44)		
History of hypothyroidism														
Yes	0 (0.0)	1 (100.0)	2.285	0.131	0 (0.0)	1 (100.0)	0.926	0.336	3.00 (0.00)	0.334	0.565	25.00 (0.00)	t = 1.398	0.167
No	45 (70.3)	19 (29.7)			31 (48.4)	33 (51.6)			6.66 (6.28)			38.11 (9.31)		
Severity of OSA														
Mild	8 (57.1)	6 (42.9)	2.743	0.254	4 (28.6)	10 (71.4)	3.420	0.181	3.93 (3.25)	2.769	0.026	35.86 (10.63)	F = 1.081	0.346
Moderate	15 (83.3)	3 (16.7)			8 (44.4)	10 (55.6)			5.67 (5.66)			40.50 (9.83)		
Severe	22 (66.7)	11 (33.3)			19 (57.6)	14 (42.4)			8.24 (7.09)			37.36 (8.53)		

PHQ- Patient Health Questionnaire

efficacy, sleep disturbance, use of hypnotic agents and daytime dysfunction. Among the mentioned parameters, sleep duration was the most affected component with most of the patients having insufficient sleep of less than 6 hours.

From Table 4, there was no association between the socio-demographic factors and clinical data with sleep quality and attention span of patients. A significant association was however observed between working status of respondent and daytime sleepiness (x^2=6.799, p-value=0.009). Patients who were employed had a higher frequency of excessive daytime sleepiness compared to those who were not employed. An association was also found between driving status and daytime sleepiness $(x^2$=4.529, p-value=0.033). Patients who drove had a higher frequency of excessive daytime sleepiness as compared to those who were not driving.

As shown in Table 4, there were no association between socio-demographic factors with depression. Nevertheless, the severity of OSA was significantly associated with depression (x^2=2.769, p-value=0.026). Patients with severe OSA had a higher mean score of depression (8.24 $\pm$ 7.09) compared to those with mild OSA (3.93 $\pm$ 3.25) and moderate OSA (5.67 $\pm$ 5.66).

The association between sleep quality, daytime sleepiness, depression, and attention span were also determined. There was no association found between sleep quality and depression as well as between sleep quality and attention span.

A significant association was observed between sleep quality and daytime sleepiness (x^2=5.963, p-value=0.051) whereby patients with poor sleep quality had excessive daytime sleepiness. Daytime sleepiness was also significantly associated with depression (F value=4.043, p-value=0.049). Patients with excessive daytime sleepiness had higher mean score of depression (8.19 $\pm$ 0.04) compared with those with normal daytime sleepiness (5.15 $\pm$ 6.16).

DISCUSSION

Based on our research, more than 50% of the participants had severe OSA and obese. Previous study had found a high percentage of OSA patients with BMI in the obese group (Kositanurit et al. 2018). Obesity was proven to be one of the major risk factors for OSA based on previous research (Flemons 2002; Rashid et al. 2014; Hamilton & Joosten 2017; Dong et al. 2020).

In terms of sleep quality and daytime sleepiness, 69.2% of the patients had poor sleep quality while 47.7% experienced excessive daytime sleepiness. There was significant association between sleep quality with daytime sleepiness with patient with poor sleep quality having excessive daytime sleepiness. This is also supported by the study done by Slater and Steier (2012), which concluded sleepiness is caused by abnormal sleep quantity or sleep quality.

In contrast with the result from previous studies (Chatterjee et al. 2012; Naismith et al. 2004), our

study found no association between poor sleep quality and depression in OSA patient. On the other hand, the association between severity of OSA and depression was significant. Higher severity of OSA was associated with more severe depressive symptoms. The findings from other studies were relatively mixed. Some studies found that more severe OSA were associated with less depressive symptoms (Bjorvatn et al. 2018; Lee et al. 2019). Some studies did not find significant association between OSA severity and depressive symptoms (Asghari et al. 2012; Macey et al. 2010).

The relationship between excessive daytime sleepiness and mental health symptoms, in particular depression, had been widely documented. Several hypotheses have been proposed regarding the disturbance of circadian rhythm via a variety of psychological and physiological events in depressed patients, leading to alteration of normal sleep-wake regulation (Germain & Kupfer 2008; Chellappa et al. 2009). Another potential factor of daytime sleepiness in depression is sleep debt. Insufficient sleep at night among depressed patients results in sleep debt, which is the total sleep hours loss as compared to the daily sleep need (Dickinson et al. 2018). Our study showed a significant association between the severity of depression and daytime sleepiness. This result is in line with another study which found that the severity of excessive daytime sleepiness predicts depression in OSA patients (LaGrotte et al. 2016). Lau et al. (2013) who did a study among OSA patient also found that sleepier

patient had higher level of depressive symptoms (p=0.035).

In terms of attention span, 40% of the patients had impaired attention span, while 13.8% of them had severely impaired attention span. In our study, no association was observed between sleep quality and attention span. This finding was in line with a research done by Twigg that showed no association between attention deficit and severity of OSA in patients having poor sleep quality (Twigg et al. 2010). However, another study proved that slow reaction time and decrease brain activation in OSA patient had a significant correlation with poor sleep quality (Ayalon et al. 2009).

Our study showed significant association between working status and driving status with daytime sleepiness in OSA patients. Patients who were working and driving had higher daytime sleepiness as compared to those who were not working and not driving. This finding particularly needs serious attention as research have shown that daytime sleepiness not only leads to work impairment and reduce work productivity among OSA patients (Waldman et al. 2020; Stepnowsky et al. 2019), but also increase proneness to traffic accident (Ozer et al 2014; Yusoff et al. 2010). Study by Ward had also reported on the high risk of near-misses in men as well as the women and high risk of motor vehicle crashes in very sleepy men (Ward et al. 2013).

Our study is not without limitations. The small sample size and the use of a single tertiary centre may not adequately represent the general

population of OSA patients.

CONCLUSION

There was a high prevalence of poor sleep quality, excessive daytime sleepiness and reduce attention span among OSA patients. Significant relationship was also observed between severity of OSA and depressive symptoms. Hence, there is a need for an early intervention and screening involving a multidisciplinary team in the care of OSA patients. The multidisciplinary team should include ENT surgeons, psychiatrists, and neurologists. OSA affects various aspects of life in the long run, psychologically as it can cause depression as well as patients' productivity in terms of driving and working status. An early diagnosis and public awareness regarding OSA is required to reduce the risk of involvement in motor vehicle accident.

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