

An audit of the sleep medicine service in Oman

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ABSTRACT

الأهداف: تقييم الخدمة المقدمة في مختبر النوم بمستشفى جامعة السلطان قابوس وذلك من أجل الارتقاء وتحسين مستوى الأداء.

الطريقة: مراجعة وتحليل تقارير فحص النوم والسجل الطبي لجميع المرضى الذين تم تشخيصهم بمختبر النوم في مستشفى جامعة السلطان قابوس - سلطنة عُمان، خلال الفترة مابين يناير 1995م وحتى ديسمبر 2006م.

النتائج: خلال الفترة المذكورة تم دراسة 1042 فحص في المختبر، 768 فحص (PSG) فقط كانت قابلة للتحليل. أظهرت الدراسة إن قسم الأنف والأذن والحنجرة (ENT) كان المصدر الرئيسي لتحويل الحالات إلى المختبر 43%، كما كان السبب الرئيسي للتحويل هؤلاء المرضى هو الشك في وجود انقطاع التنفس أثناء النوم (OSA) بنسبة 38%، ولكن الشخير جاء في المرتبة الأولى من حيث الأعراض بنسبة 33%. ثلاثة أرباع المرضى كانوا ذكور وهم أصغر سناً وقل وزناً (BMI) مقارنة بالإناث ($p < 0.0001$). رغم العدد الكبير من المرضى الذين كان معدل انقطاع التنفس أثناء النوم عندهم أكثر من 15 (261 مريضاً)، إلا أن 94 مريضاً 36% فقط حصلوا على جهاز ضغط الهواء الموجب (CPAP).

خاتمة: تخصص أمراض النوم في مستشفى جامعة السلطان قابوس يقدم المستوى الأساسي من التشخيص، وظهر مدى أهمية هذا التخصص. وعليه، يجب بذل جهود أكبر من أجل الارتقاء بالخدمة للمستوى العالمي.

Objective: To audit the sleep service at Sultan Qaboos University Hospital (SQUH), Muscat, Oman, and to explore deficiencies to introduce new measures of improvement.

Methods: Polysomnography (PSG) reports and SQUH medical records of all patients who underwent sleep studies from January 1995 to December 2006 in the sleep laboratory at SQUH were reviewed and analyzed.

Results: Out of a total of 1042 sleep studies conducted in the specified period, 768 PSG recordings were valid for analysis. The audit showed that the Otolaryngology

Department was the main referring specialty for PSG (43%). Snoring was the main symptom for 33% of the subjects referred, but suspicion of obstructive sleep apnea was the main reason for referral (38%). Three quarters of the patients were males who were also younger, and with lower body mass index compared to females ($p=0.0001$ for all). Despite large number of patients with an apnea-hypopnea index of >15 ($n=261$), only 94 (36%) patients received continuous positive airway pressure titrations and treatment.

Conclusion: The sleep medicine service in SQUH provided the basic service, and raised the awareness of the importance of this specialty. However, substantial effort is required to bring it to international standards.

Saudi Med J 2008; Vol. 29 (11): 1621-1624

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Received 14th July 2008. Accepted 18th October 2008.

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Sleep medicine is a relatively new medical specialty, but it has developed and expanded rapidly over the past 3 decades. Sleep medicine awareness and services have increased in tandem with doctors and patients' awareness of the risks of snoring and related sleep disorders, mainly; the obstructive sleep apnea/hypopnea syndrome (OSAHS). Obstructive sleep apnea/hypopnea syndrome is a disorder characterized by repetitive upper airway collapse during sleep in association with daytime sleepiness. It has an estimated prevalence of 2% among middle-aged women, and 4% among middle-aged men.¹ The OSAHS-related features include excessive daytime sleepiness,² neurocognitive impairment,³ and increased motor vehicle accidents.^{4,5} It has also been associated with adverse cardiovascular

diseases such as hypertension and ischemic heart disease, as well as, abnormalities of BP and heart rate variability. Recently, OSAHS has been shown to be associated with cerebrovascular disease such as stroke.⁶ The treatment of OSAHS improves the quality of life, and prevents the above-mentioned complications. However, its accurate diagnosis is essential. In addition to proper clinical assessment, full overnight polysomnography (PSG) provides the gold standard method of diagnosing OSAHS. Furthermore, PSG is used in diagnosing other sleep disorders such as narcolepsy and other sleep parasomnias. Although the prevalence of OSAHS in Oman and other Arab countries is not yet known, our assumption is that it would not differ from the rest of the world. In Oman, sleep medicine is a neglected medical specialty, mainly due to lack of awareness of most physicians, health authorities, and hence, the community at large. Sleep medicine services lacked the facilities, and the trained technical and medical personnel. For the past 11 years, the sleep laboratory at Sultan Qaboos University Hospital (SQUH), Muscat, Oman has been the only sleep laboratory in the country. The different types of sleep studies conducted in this sleep laboratory included; routine PSG, continuous positive airway pressure (CPAP) titration with PSG and multiple sleep latency test (MSLT). The method of conducting routine PSG in SQUH requires an overnight hospital admission with monitoring of the following: 2 channels of electroencephalogram, 2 electro-oculogram, chin and legs electromyography, and electrocardiogram. Respiratory events are monitored by an airflow sensor, chest, and abdominal movement sensors. Leg movements and sleep position were also monitored using special sensors. Oxygen saturation was assessed by pulse oximetry, and the patient was observed by infrared camera. The test is usually supervised by a trained technician (polysomnographer) who is also responsible for the scoring of the study. There was no dedicated sleep clinic, and no Epworth sleep evaluation prior or after PSG. The test was reported by physicians from the Department of Clinical Physiology and Department of Medicine who had limited training in sleep medicine. There is no published literature to-date describing the sleep medicine service in the Sultanate of Oman. The objective of the present audit is to conduct retrospective analyses of the sleep medicine services over the past 11 years with the aim of working out plans of bringing the service up to international standards. This will involve plans for patients' care, personnel training, and technical developments, as well as enhancing general awareness of sleep-related disorders in Oman.

Methods. All patients listed in the registry of the sleep laboratory of the Clinical Physiology

Department at SQUH, Muscat, Oman were included in the analysis. Polysomnography reports and hospital medical records of all patients who underwent PSG from January 1995 to December 2006 were reviewed. The audit was approved by the Sultan Qaboos University Ethics Committee. The data were collected from 2 sources; PSG reports and hospital medical records. Besides anthropometric measurements, the report provided the type of sleep study performed such as diagnostic routine (standard PSG), repeat PSG (the test was repeated for the following reasons; post uvulopalatopharyngoplasty, inefficient sleep study, and in some cases the reason could not be identified), CPAP titration, an overnight oximetry, or MSLT. Results of the sleep study, for example, apnea-hypopnea index (AHI), and oxygen desaturations were also obtained from these reports. Additional information was obtained from the hospital medical records in SQUH. Extensive efforts were also undertaken to review and obtain patients' medical records from other referring hospitals. The records were used to collect demographic information, details of patients' presenting symptoms, such as history of snoring, insomnia, periodic leg movements, disturbed sleep, and accidents due to daytime sleepiness. The same records were used to collect information regarding co-morbidities or risk factors (hypertension, diabetes, hypothyroidism, and so forth). Reasons for referrals were categorized as snoring, daytime sleepiness, disturbed sleep, labeled with obstructive sleep apnea (OSA), post-operative (uvuloplasty, somnoplasty), insomnia, narcolepsy, and obesity.

Statistics. Statistical analysis was carried out using SPSS package for Windows version 13. Data are expressed as means (SD) or frequencies. Probability values of <0.05 were considered statistically significant. Presenting symptoms, referral hospitals, and specialties are presented as frequencies. Chi square test was used to test the association between referring symptoms and gender difference. Age, body mass index (BMI), and AHI differences between males and females were performed using independent sample T-test with 95% confidence intervals.

Results. Out of a total of 1042 sleep studies conducted between January 1995 and December 2006, 242 (23%) studies had no files or reports, and 32 (3.1%) studies had incomplete data. The audit was therefore carried out on the remaining 768 studies (73.7%). Out of the 768 patients studied, 658 (85.7%) were routine diagnostic PSG in which, 52 (7.9%) were repeated studies. There were only 94 (12.4%) CPAP titrations. The remaining sleep study types are shown in Table 1. The age of patients ranged from 12-80 years

with mean age of 41 ± 15 years. The male, female ratio of studied patients was approximately 3:1. Females were significantly older than males (45 versus 39 years, $p=0.0001$), and had higher BMI (36 versus 31 kg/m^2 , $p=0.0001$). Males more commonly presented with symptoms of snoring and periodic leg movement (PLM [$p=0.0001$], compared to females ($p=0.04$). The peak age of presentation among men was 30-40 years. Women tend to present at an older age for sleep study with peak age between 50-60 years (Table 2). Most referrals came from otolaryngology (ENT) with 42.8%, followed by respiratory medicine (18.2%). The remaining referrals came from other specialties (37.7%) (neurology, cardiology, endocrinology, and so forth). There were also 9 pediatric cases (1.2%). Table 3 shows the common reasons for referral as reported by the referring physicians. Patients labeled with OSA were the most common reason for referral (37.9%), and came mostly from ENT doctors. Many patients were referred because of snoring (33.2%) as the reason to carry out sleep studies, while fewer referrals were for daytime sleepiness, disturbed sleep, and obesity. The outcome of routine studies was categorized into 4 groups: AHI <5, 5.1-10, 10.1-15, and >15. Sleep studies with sleep efficiency <50% were excluded from the analysis ($n=28$). Out of the total of PSG studies, 261 patients (40%) had AHI of more than 15, 187 (32%) had an index of 5-15, and 183 (28%) had an index of less than 5.

Discussion. This is the first audit to-date describing the sleep medicine service in the Sultanate of Oman. Sultan Qaboos University Hospital has the only diagnostic sleep laboratory in the country with a population of approximately 2.5 million. The laboratory had 2 beds, supervised by 2 polysomnographers, and one reporting physician. The service was mainly diagnostic, and apart from the few CPAP titrations, and few repeated studies it offered no other therapeutic measures, and no clinical follow-up. In the past 11 years, we have conducted 1042 PSGs with an average of 95 PSG/year (4.1/year/100,000). This clearly indicated that facilities designated for sleep medicine are underdeveloped in Oman compared to neighboring countries like, the Kingdom of Saudi Arabia with 7.1/year/100,000, and other developed countries.⁷

Three quarters of patients were males who were also younger compared to females. The peak age of presentation was in the fourth decade for males, and sixth decade for females. Moreover, females were more obese than males. These results are in agreement with the prevalence of OSAHS^{8,9} in general, and in post-menopausal females.¹⁰ Patients were referred from different medical and surgical specialties, predominantly otolaryngology

Table 1 - Sleep study types.

Sleep study type	Frequency (%)
Routine study	602 (78.4)
Repeat routine	56 (7.3)
Continuous positive airway pressure	94 (12.2)
Limited oximetry	5 (0.7)
Oxford medilog	1 (0.1)
Multiple sleep latency test	10 (1.3)
Total	768 (100)

Table 2 - Characteristics of the study sample and reason for referrals.

Variable	Male (%)	Female (%)	P-value
Age (years)	39	45	<0.0001
Body mass index (kg/m^2)	31	36	<0.0001
Snoring	211 (79.6)	54 (20.4)	0.0001
Daytime sleepiness	25 (62.6)	15 (37.5)	0.28
Disturbed sleep	46 (80.6)	11 (19.3)	0.07
Obstructive sleep apnea	226 (71.5)	90 (28.5)	0.6
Post-surgical operation	13 (86.7)	2 (13.3)	0.35
Insomnia	11 (78.6)	3 (21.4)	0.7
Obesity	25 (36.8)	43 (63.2)	0.001
Periodic leg movement	9 (100)	0 (0)	0.04

Table 3 - Distribution of referring reasons from different specialties.

Symptoms	Specialty				Total
	ENT	Respiratory	Pediatric	Others	
OSA	150	77	4	60	291
Snoring	171	33	4	37	255
Obesity	9	15	0	31	65
Disturb sleep	22	5	1	26	54
Daytime sleepiness	10	7	3	19	39
Post-op	13	1	0	1	15
Insomnia	0	1	0	11	12
Narcolepsy	0	0	0	3	3

ENT - otolaryngology, OSA - obstructive sleep apnea,
Post-op - post operative

(42.8%). The main reason for the sleep study referral was OSA, which might be explained by the fact that the referring physician suspected OSA in his patient without taking further clinical details of the patients' condition. However, the most common documented symptom was snoring, which was significantly more in males than females, and this is in concordance with the published literature.^{9,11} One of the important findings of this audit was that daytime sleepiness was not properly assessed using a standard scale such as the Epworth

Sleepiness Scale.¹² Therefore, it was not considered as a major reason to investigate for OSAHS in spite of being a major complaint in OSAHS,⁹ and a very alarming symptom especially in sleepy drivers.^{4,5} This audit also showed that other sleep disorders such as narcolepsy might be uncommon among the Omani population since only 10 MSLT studies were carried out within the same period, and that is less than one study per year. There were only 3 referrals with suspicion of narcolepsy. However, without a formal epidemiological study, it would be very difficult to draw a firm conclusion regarding the prevalence of this sleep condition in Oman.

The outcome of the diagnostic sleep studies revealed that 261 (40%) patients had AHI >15, the criterion of diagnosing OSAHS. This could be because the symptoms of OSAHS were not explicitly explored and therefore, subjects with a low suspicion index were referred for PSG, hence, the low percentage of positive results. Furthermore, the percentage of positive results raised slightly (43%) when lower criterion of diagnosing OSAHS (AHI>10) was used.¹³ Only 94 (36%) patients underwent CPAP titration, which clearly indicates that OSAHS patients were undertreated in SQUH compared to other sleep centers.^{14,15} However, it might be explained by the fact that there were no proper follow-up systems (sleep medicine clinic), and the study reports were sent back to the referring doctors. Therefore, it would be expected that patients might have received different advice or treatment. In addition, CPAP machines were not provided freely by the health service, and a significant number of patients may not have been able to afford the cost, hence, the low CPAP titration studies. Moreover, there was no system of checking-out CPAP use and compliance, which is an important aspect in OSA treatment.¹³

This audit revealed that the sleep medicine service in Oman, though basic, is far from international standards, mainly due to the lack of a structured focused clinical service. This highlights the need for establishing a service with a dedicated sleep medicine clinic, properly trained physicians and technologists, as well as a well-equipped sleep laboratory that offers free CPAP treatments.

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