Sleep Apnoea and its Relationship with Cardiovascular, Pulmonary, Metabolic and Other Morbidities

Abstract:
Peamount Hospital, Newcastle, Co Dublin

Sleep apnoea (OSAS) is a multisystem disorder. There is a high prevalence of cardiovascular and metabolic morbidities in patients investigated for sleep apnoea. We aim to evaluate any association between cardiovascular, metabolic and pulmonary co-morbidities and whether insomnia index (ESS) and snoring helps in diagnosing sleep apnoea. 258 consecutive patients who were electively admitted for sleep assessment in Peamount Hospital, Dublin from Sept 2009 to Aug 2011 were retrospectively reviewed. 139/258 were diagnosed as OSAS (97% males, 3% females) and as non OSAS (56% males, 44% females). As we know excessive weight deposition and dyslipidaemia. Weight loss has been accompanied by improvement in characteristics related not only to obesity but to OSAS as well, suggesting that weight loss might be the most vital step in the management of both conditions. Over 5000 European sleep apnoea patients database suggested high prevalence of cardiovascular and metabolic morbidities among them. It has also been mentioned that sleep-disordered breathing is likely to be a risk factor for hypertension and consequent cardiovascular morbidity in the general population. As we know excessive daytime sleepiness, snoring, and fatigue are the major symptoms of patients with OSAS, there are few scoring systems developed to diagnose OSAS, namely, Epworth Sleep score (ESS) is one of them. The validity of this questionnaire and its relationship with sleep studies is still questionable.

We sought to determine whether clinical findings based on ESS help in diagnosing sleep apnoea and we also aim to evaluate any association between cardiovascular, metabolic and pulmonary comorbidities in patients investigated for related disorders.

Methods
A retrospective two years review of 258 consecutive patients who were electively admitted for sleep assessment in Peamount Hospital, Dublin from Sept 2009 to Aug 2011 was performed and analysed using statistical software R version 2.12 [cite R Development Core Team (2010). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org/]. Patients admitted to the study included all those that were more than 20 yr of age, symptoms of daytime somnolence, fatigue, snoring history, and at least one of the patient’s complaints (ESS) and snoring as mentioned above. 139/258 patients were diagnosed as OSAS. Cardiovascular, metabolic and pulmonary co-morbidities were 46.12%, 37.2% and 29% respectively. Of the 258 patients, 139 (77.6% males, 22.3% females) were OSAS and 119 (47% males, 54% females) were NON OSAS. Their PSG variables were calculated to formulate the diagnosis of sleep apnoea and categorize it accordingly. Apnoea is defined as more than 90 percent dropping of baseline airflow with continued chest wall and abdominal wall movement for a minimum of 10 sec, regardless of whether or not there was an associated oxygen desaturation or sleep fragmentation; hypopnoea is defined as the mean amplitude of the three largest breaths in the two minutes preceding the onset of the event. The definition of hypopnoea was a 50 percent or greater reduction in airflow for a minimum of 10 seconds, associated with an equal to or greater than a 4 percent drop in SpO2 or an EEG alpha wave arousal. The definition of desaturation episode was equal or more than a 4 percent drop in SpO2, which was induced by apnoea or hypopnoea events. Apnoea hypopnoea index (AHI) was the number of apnoea plus hypopnoea events per hour of total sleep time, and desaturation index (DI) was the number of desaturation episodes per hour of total sleep time. AHI helps in defining and grading the severity of OSAS. An AHI of less than 5 is considered normal; 5-15 is mild; 15-30 is moderate; and more than 30 events per hour characterises severe sleep apnea.

The medical notes of all 258 patients, who had PSG, were reviewed. Among them, we further analyzed the prevalence of cardiovascular diseases including Hypertension (HTN), Ischaemic Heart Disease (IHD), Valvular Heart Disease, Arrhythmias; Pulmonary diseases including Asthma, Chronic Obstructive Pulmonary Disease (COPD); Hyperlipidaemia; Endocrinological diseases including Hypothyroidism, Diabetes; Gastroenterological diseases including Gastritis, Gastroesophageal Reflex Disease (GERD), Hiatus Hernia (HH), Peptic Ulcer Disease (PUD) and Depression.

Results
The patients were divided in Sleep apnoea (OSAS) and non sleep apnoea (NON OSAS) group on the basis of their PSG variables as shown in Table 2. Of 258 patients, 139 (77.6% males, 22.3% females) were OSAS and 119 (47% males, 54% females) were NON OSAS. As per AASM criteria for scoring sleep apnoea, our OSAS group was further divided in mild (56%), moderate (24%) and severe (20%) sleep apnoea. In OSAS group, there are strong correlations found between age (p<0.001, r=0.162), sex (p=0.002, r=0.296), BMI, and snoring history showing an increased prevalence of sleep apnoea in elderly, obese, male smokers but there is no correlation found between ESS (p=0.743, r=0.026), with AHI. As sleep experts know, females with OSAS exhibit a lower AHI, less severe hypoxaemia and greater BMI. Similarly in NON OSAS group, there is no correlation found between ESS (p=0.963, r=-0.007) with AHI as shown in the Table 3. It reconfirms the statement that all snorers are not sleep apnoeic and sleep apnoea can not entirely be diagnosed with clinical evaluation sleep scores.

In addition, the prevalence of co-morbidities was split into two major stems of OSAS and NON OSAS group. It showed higher prevalence of cardiovascular diseases in OSAS group (13% vs 8%), hyperlipidaemia (27.3% vs 25%) and hypothyroidism (8.6% vs 5.8%) in comparison to NON OSAS group as shown in the Table 4.
in Table 4. It is also found that respiratory diseases including COPD and asthma are also slightly more prevalent in OSAS group than NON OSAS but less frequently compared to metabolic and cardiovascular diseases.

A statistician has been consulted and a multivariate model has been fitted to identify factors jointly associated with OSAS. In order to determine the factors that influence the presence of OSAS in a multivariate model, a backwards stepwise logistic regression was fitted, Factors entered included ESS, Smoking, Age, BMI and Gender. In the final model Age (p=0.001), ESS (p=0.001) and BMI (p=0.001) were statistically significantly associated with OSAS. It is also analyzed that there is a relatively higher prevalence of depression 28/258, (10.8% vs 8.5%) in all patients enrolled for PSG, as compared to the general population, who do not have exhibiting risk factors for PSG enrollment. In addition, 54/258 (21%) of all high risk sleep apnoea patients suffer from gastrointestinal disorders. Similarly, it was observed that ESS score is far considered than the hypoxaemia in the OSAS group. OSAS is one of the most common causes of failure to diagnose OSAS. In general, OSAS is more common in elderly and obese, male smokers. There is a higher prevalence of cardiovascular, pulmonary, and metabolic co-morbidities in high risk sleep apnoea subjects.

Discussion

A large proportion of adult patients who are referred to sleep disorder centres have excessive daytime sleepiness. ESS is a simple, self administered questionnaire which provides a measurement of persons day time somnolence. The majority of patients (almost 60%) are unable to answer all of the ESS question items. It may underestimate sleepiness severity in older subjects. In order to confirm the presence of upper-airway closure during sleep and to assess the severity of OSAS, PSG is a gold standard investigation. Pressure [CPAP] ventilation not only plays an important role in treating OSAS but also appears to be significant for treatment resistant and high risk of the formation of arterial lesions. Further described Continuous Positive Airway Pressure [CPAP] ventilation not only plays an important role in treating OSAS but also appears to be significant for refractory HTN.

Metabolic disorders in OSAS has been studied and shown a close relationship between OSAS and increasing prevalence of hyperlipidaemia. There is 33.8% prevalence of hyperlipidaemia in OSAS population and it is independent of gender difference, likewise in our study a 27.3% prevalence is identified. There is 10.6% prevalence of more than one metabolic disorder including HTN, hyperlipidaemia and diabetes in patients suffering from OSAS, as compared to 13.1% in our Irish cohort.

Considering pulmonary complications in OSAS, Flennley described combination of COPD and OSAS as Overlapping syndrome of sleep apnoea [OSA] which is characterised by hypoxia, hypercapnia, pulmonary arterial hypertension and nocturnal hypoxemia. It is estimated that 60% of all general population that about 32.5% people suffer from COPD in Ireland. In the European Union, general prevalence of COPD lies in the range of 4 -10% as per EUPHAS summary in December 2009. COPD prevalence, in our sleep apnoea patients is 13.6%, which correlates closely to international findings. OSAS is an independent risk factor for hypertension with 30% prevalence of occult sleep apnoea among middle-aged males with so called primary hypertension. The results of our study identified similar results in the Irish population, showing a 33.1% prevalence of hypertension in OSAP group. Peppard describes the more severe the sleep apnoea, the higher the prevalence of hypertension. OSAS-related hypertension is predominantly diastolic and nocturnal, affecting non-dippers, triggering refractory hypertension. Further described Continuous Positive Airway Pressure [CPAP] ventilation not only plays an important role in treating OSAS but also appears to be significant for refractory HTN.

Negative intrathoracic pressure in OSAS patients have been suggested as the underlying mechanisms of nocturnal gastro-oesophageal reflux diseases (GORD). Obesity is a common factor and a cause of the high prevalence of GORD in OSAS patients. It has also been described that the treatment of OSAS with nasal CPAP helps in improving nocturnal GORD symptoms. In the frequency of asthma exacerbations and poor control in OSAS are neuromechanical reflex bronchospasm, gastrooesophageal reflux disease, local and systemic inflammation and OSAS-induced cardiac dysfunction. There is a higher prevalence of OSAS symptoms in an asthmatic population (35.5%) when compared to a primary care population (27.2%). Interestingly, in comparison to our study prevalence of asthma in OSAS patients is much lower than international standards at 17.2%. Justification of this may be due to diagnosis of sleep apnoea by asthma diagnosis. Also, COPD may be over diagnosed instead of asthma as both are overlapping obstructive ventilatory defects.

References


Correspondence: F Khan
AMHCC, Tallaght, Dublin 24
Email: drsrahemkhan@gmail.com

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