

Obstructive Sleep Apnea: A Critical National Threat

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Abstract

Obstructive sleep apnea (OSA) is a sleep disorder that is causing personal and national negative impact in addition to the patient's health hazards. This mini-review article highlights these issues to encourage more studies concerning this area of the sleep medicine research and draws the attention of the medical authorities to this dangerous disorder.

Keywords: *Obstructive Sleep Apnea; Road Traffic Accidents; Nation; Economic Cost; Laws, Personal Relationship, Academic Performance, Work, Insurance*

Abbreviations

OSA: Obstructive Sleep Apnea; RTA: Road Traffic Accidents; CPAP: Continuous Positive Airway Pressure; USA: United States of America; USD\$/\$: United States Dollar; AASM: American Academy of Sleep Medicine; FMCSA: Federal Motor Carrier Safety Administration

Introduction

Obstructive sleep apnea (OSA) is a well-known sleep disorder characterized by repeated episodes of airflow cessation during sleep leading to sleep fragmentation, sympathetic overstimulation and oxygen desaturation [1], these pathological events causing release of different biomarkers [2], systemic inflammation [3], endothelial dysfunction [4], increased blood coagulability and platelet aggregation [5] and metabolic dysfunction [6] ended by development of different systemic diseases affecting all body organs (especially end organs e.g. eye [7]) like hypertension [8], diabetes mellitus [9], cardiovascular diseases [10] and cerebrovascular accidents [11] up to sudden death [12]. It is symptomatized by daytime and night symptoms. Although night symptoms (e.g. snoring, choking, witnessed apnea) are agonizing to the patients and his/her bed partner, but still the daytime symptoms are more serious. These daytime symptoms are excessive daytime sleepiness, fatigue, mood changes and cognitive functions impairment (e.g. Deficits in attention and vigilance, executive functioning, and memory impairment) [1,13-16].

The researchers found that OSA patients had a poor personal relationships due to mood fluctuations, depression, poor social activities, unacceptance of the family of the disease, bad sleep quality of the partner or may be due to erectile dysfunction or abnormal sexual behavior. However treatment of the condition (either by continuous positive airway pressure (CPAP), surgery or oral appliance) can improve this problem and saves those stressed relationships [17-22].

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In the work environment OSA patient is showing the personality changes, reduced work quality i.e. reduction of work productivity (presentism), absence from the work (absenteeism), higher rates of occupational accidents and injuries and long sick leaves (longer than 30 days). They used to take naps at work, even at important business meetings or during dangerous work missions. Again proper treatment of OSA by CPAP and oral appliances is helpful in improvement of patient's work ability and performance [23-26].

Even among the diseased children and the teenagers or university students, the studies found that the snoring or witnessed apneas and daytime sleepiness were independent predictors of poor academic performance. Poor academic achievements correlated with reduced attention, due to excessive daytime sleepiness caused by sleep fragmentation and short sleep duration of OSA. There is an increased risk of behavior problems such as somatic complaints, oppositional or aggressive behaviors and social problems associated with OSA in school-aged children. This issue should be highlighted to parents, teachers, and clinicians especially there is an improvement in academic functioning after proper use of CPAP and adherence to it [27-31].

Many evidence had proved a stronger link between driving performance and increased road traffic accidents (RTA) (especially sleep related RTA) especially among untreated commercial motor vehicle drivers. The performance of drivers with untreated sleep apnea degrades more quickly over time than drivers without sleep apnea. In the EU IMMORTAL project, the authors concluded that the most medical conditions such as vision impairment, hearing impairment, arthritis, diabetes and even alcoholism increased the relative risk of RTA by (0.2 up to 1) but OSA had the highest risk of causing RTA, with a relative risk of (3.71) which is second only to age and gender as a general risk factor for RTA. The sleepiness is the major contributing factor to RTA risk in OSA. The characteristics of sleep related RTA are those RTA which occur late at night, early morning or mid-afternoon; or those that resulting in a higher than expected severity, involve a single vehicle leaving the roadway, occur on a high-speed road, or which involve a driver who is the sole occupant in the vehicle and who does not attempt to avoid the crash, as indicated by the absence of brake marks. Many international disasters were found to be caused due to suffering of the crewmen from severe OSA like the collision of two Canadian National/Illinois Central railway trains near Clarkston, Michigan on November 15, 2001. Several studies found that the effective treatment strategy (using CPAP) of the drivers with OSA resulted in substantial decreases, or even normalization, of the risk of RTA [26,32-36].

Although the exact economic costs are difficult to be calculated, OSA are producing a huge economic burden (billions of dollars per year) and is comparable to other chronic diseases. The different items of this huge cost seems to be due to (work related, health care utilization related or RTA related) Firstly, OSA in any workforce accounts for many types of costs, among which are workers' compensation costs, health care costs, safety and insurance-related costs, productivity costs, and brand protection costs. Secondly, OSA sufferer adds to the cost of public healthcare due to making more than twice the number of physician claims as non-OSA patients. The difference in healthcare utilization between OSA patients and their matched controls was found to be reduced after the OSA was diagnosed and treated effectively. Thirdly, the costs attributed to RTA related to OSA represented a cost of about USD 16 billion per year, treating all drivers with CPAP would reduce the cost by about USD\$11 billion per year. The American Academy of Sleep Medicine (AASM) in 2016 estimated that the cost of undiagnosed OSA in American adults included \$86.9 billion due to lost productivity and absenteeism, \$30 billion because of associated comorbidities, \$26.2 billion due to RTA, \$6.5 billion due to occupational accidents with a total cost of \$149.6 billion in 2015. Although diagnosing and treating every case of OSA patients would cost the healthcare system additional \$49.5 billion, there would be saving of \$100.1 billion [37,38].

In just few countries there is a recognition of this problem with the importance of integration of strict legal consideration. United states of America (USA) for example recognized this problem by the Federal Motor Carrier Safety Administration (FMCSA) in 2012 and the European Union (EU) in 2016 Directive on Driving Licenses stated that the drivers should be examined by a specialist for possibility of OSA and the diseased drivers should not be licensed until they treated by effective treatment strategy with periodical medical review every

year for commercial drivers and every 3 years for non-commercial drivers. However, these legal recommendations are not integrated in the other world countries medical insurance and driving legislation laws although it is a very important and very costly as a medical disorder even more than any other diseases. OSA could be easily predicted during routine medical examination if the neck circumference is ≥ 39.5 cm especially if the sleepiness grade was ≥ 7 on Epworth sleepiness scale. Also the somnologist can use the following parameters: mean daily sleep hours, sleep efficiency %, slow wave sleep %, REM % in prediction of sleep related accidents among commercial drivers with OSA [39-43].

Conclusion

In conclusion, OSA is a major medical disorder and can negatively deteriorate the general health of the patient with development of different systemic diseases. However the main problem is found to be related to poor academic performance of the student or reduced work quality with the increase of occupational and road traffic accidents rates and the personal relationships getting worse in untreated OSA patients all these issues leading to huge economic cost by the recurrent use of the health care facilities or no work productivity as well as accidents and the related consequences of using the insurances. So, after reviewing the literatures, I recommend to integrate the OSA diagnosis and treatment in the routine medical examination, insurance regulating laws as well as in driving license legislation. Moreover, each item in this article needs thoroughly comprehensively well designed studies to explore this problem obviously.

Conflict of Interest

No conflict of interest to be declared.

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