Hypersomnolence and Traffic Safety

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KEYWORDS

• Drivers • Drowsiness • Sleepiness • Narcolepsy • Obstructive sleep apnea

KEY POINTS

- Drowsiness is a major cause of motor vehicle accidents.
- Common sleep problems implicated in hypersomnolence are sleep deprivation, obstructive sleep apnea, and central hypersomnias.
- The optimal management of sleep disorders and sleep deprivation can improve vigilance, thereby reducing the odds of having an accident.
- Diagnostic tests are available to measure sleepiness and these tests may be used to assess fitness-to-drive.
- Physicians, particularly family physicians and general practitioners, should be educated regarding the risk of sleepy driving and the importance of routine assessment of fitness-to-drive among patients.
- Legislation should be drafted to assess hypersomnolence before granting driver's licenses.

INTRODUCTION

Motor vehicle accidents (MVAs) are a leading cause of mortality and morbidity worldwide and are expected to be the fourth leading cause of death in 2030.[1,2] Approximately 1.3 million people die per year worldwide because of MVAs, and another 20 to 50 million sustain nonfatal injuries that lead to significant disability.[1] The available data suggest that fatigue and sleepiness are major risk factors for MVAs.[3] Although it is difficult to estimate the number of MVAs that involve drowsy drivers, some modeling studies have estimated that the rate for fatal accidents is 15% to 33%.[4] Drowsiness results in several types of neurologic dysfunction, such as reduced reaction time, decreased attention, and impaired decision-making skills.[4] A French study of 4774 drivers reported that 11.8% of the sample had Epworth Sleepiness Scale (ESS) scores of 11 or higher, 28.6% reported experiencing sleepiness at the wheel severe enough to require stopping, and 46.8% and 39.4% reported feeling sleepy during night-time and daytime driving, respectively. Moreover, 10.7% reported a near-miss accident during the previous year (46% of which were reportedly sleep-related) and 5.8% reported having an accident (5.2% of which of were sleep-related).[5] The Centers for Disease

Funding: This work was partially supported by a grant from the National Plan for Science and Technology Program by the King Saud University Project in Saudi Arabia. The sponsor had no role in the design or conduct of this research.

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Sleep Med Clin ■ (2017) ■–■
http://dx.doi.org/10.1016/j.jsmc.2017.03.018

Control and Prevention reported that drowsy drivers were responsible for nearly 72,000 accidents, 44,000 injuries, and 800 deaths in 2013.[6] However, this report further mentions that this major risk factor is grossly underreported. Moreover, the report indicates that certain groups of drivers are prone to experience drowsiness during driving. People at risk are those who do not get adequate sleep (for any reason); drivers who operate commercial vehicles, including trucks and buses; drivers who use substances that promote drowsiness (eg, sleeping pills, alcohol, and opiates); and those who are suffering from sleep disorders.[6] This report specifies that people who sleep less than 6 hours per day and those who snore are at higher risk of falling asleep at the wheel.[6] A short period of sleeping during the night and a long duration of driving have been found to increase the chances of rear-end collisions, as well as accidents involving a single vehicle.[7] In addition, nighttime driving increases the chances of accidents.[8]

This article discusses the available evidence that relates MVAs with drowsiness, sleep deprivation, or sleep disorders. Moreover, it explores the legislative position of sleep-related factors in terms of issuing driving licenses in different countries. It further examines the evidence regarding the effect of sleep disorder treatment on MVAs.

SLEEP DEPRIVATION

Sleep deprivation can be acute or chronic. Acute sleep deprivation refers to a condition in which one is unable to sleep for a whole night or a major portion of it. Chronic sleep deprivation is defined when a person is not getting sufficient daily sleep for a few days to several weeks. This type of sleep deprivation also has a cumulative effect; thus, the person is chronically deprived of sleep after a few days. Both types of sleep deprivation have ill effects on health. In the United States, it has been estimated that 56,000 accidents per year are related to sleep deprivation.[9] A similar link between sleep deprivation and an increased risk of MVAs has been reported in other countries.[10,11] It has been found that after 17 hours of continuous wakefulness, cognitive functions (eg, reaction time and hand-eye-coordination) are greatly impaired and an increasing number of errors are made.[12] Attention, as well as the ability to process the information, is also drastically impaired.[12] After 17 hours of continuous wakefulness, cognitive and psychomotor performance decreases to a level comparable to the performance impairment detected among those with a blood alcohol concentration of 0.05%, which is not safe for industrial and driving work.[12] Another study examined the impact of the length of wakefulness on performance impairment during simulated afternoon and midnight driving in a group of healthy people with normal sleep duration (7 hours) before they took the test.[13] The results suggested that nighttime driving was associated with increased sleepiness and enhanced risk of accidents, owing to the longer period of wakefulness despite normal sleep duration on prior nights.[7,13,14] Whether 6 to 7 hours of sleep is enough for a daytime driving is also questionable.[7,15] Adolescents obtaining 6.5 hours of nighttime sleep for 5 days were found to perform worse on simulated driving than those who had 10 hours of nighttime sleep when the test was taken during the daytime.[15] While on duty, long-haul truck drivers frequently cut down their sleep up to 4 hours per day and thus become sleep deprived, increasing the chances of an MVA.[16] Another study reported that approximately half of truck drivers worked unrealistic schedules, with more than 50 hours of driving per week, and 27% of drivers reported poor sleep quality.[17] A higher prevalence of sleep debt has been reported in professional drivers compared with control participants.[18] These examples show the effects of chronic partial sleep deprivation on the risk of MVAs. An increased duration of wakefulness, when combined with alcohol use, has been found to impair driving performance, even during the elimination phase of ethanol consumption.[19]

The impact of sleep deprivation on the risk of MVAs seems to be influenced by age. In a counterbalanced design study that assessed the effect of sleep restriction for the preceding 5 hours on prolonged (2 hours) afternoon simulated driving in 20 younger (mean age 23 years) and 19 older (mean age 67 years) healthy drivers revealed that after sleep restriction, young drivers exhibited significantly more sleepiness-related lane deviations and greater low-frequency electroencephalography (EEG) power (4–11 Hz), indicating sleepiness.[20]

OBSTRUCTIVE SLEEP APNEA AND SAFE DRIVING

Snoring is a sign of obstructive sleep apnea (OSA), a common sleep disorder that affects between 6% and 17% of the population.[21] OSA is associated with poor performance on the psychomotor vigilance test.[22] Several studies have shown that, compared with controls, OSA patients have a higher risk of falling asleep while driving and are 3 times more likely to cause MVAs.[3,23,24] However, there is no compelling evidence to restrict driving in patients with OSA, unless they have a history of MVA.[25] The American Thoracic Society defines a