

Drowsy Drivers - Medical Implications of Highway Traffic Safety

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ABSTRACT

The estimates of the contribution of drowsiness and fatigue to the number of road crashes is often neglected considerably, due both to under-reporting of these factors by drivers, and technical difficulty in investigating the problem. Preventing and treating the reasons for falling asleep behind the wheel may have considerable contribution in traffic safety. Therefore the licensing authorities in co-operation with the medical profession should attend more closely to the issue of sleep related disorders and their implications for driving in cases with notoriously high risk. The police and other enforcement authorities need appropriate knowledge and procedures to detect drivers at risk of falling asleep while driving. Considering the increasing number of road traffic accidents day per day, it is a need of the hour to detect drivers possibly at risk, and to take appropriate precautions in terms of education, advice and treatment regimes, as well as restrictions on licensing.

KEY WORDS

drowsy driver, Epworth Sleepiness Scale, highway accidents, primary prevention, secondary prevention, sleep apnea syndrome, sleep disorders.

INTRODUCTION

On Third January, 2009 four people died and more than 30 others were injured when a bus fell into the stony banks of fast flowing Madi River at Titahar VDC section of the Pokhara-Baglung highway in Parbat district (Western Region of Nepal). The bus (registration no. Ga 1 Kha 2692), which was heading to Beni from Kathmandu, skidded off the road and fell 20 meters. Among the survivors, 11 were brought to the casualty of Manipal Teaching Hospital, Pokhara, the nearest tertiary care center. Among them, 8 sustained significant bony injuries requiring orthopedic intervention while the rest had only superficial soft tissue injuries which could be managed conservatively. The driver survived the accident. On examination, he was not under the influence of alcohol, visual acuity was 6/6 in both the eyes, there were no features suggestive of nyctalopia, cognition was intact and central nervous system examination was within normal limits. On enquiry, he had taken a cup of coffee and two cigarettes an hour before the accident and denies any substance abuse. He related the cause of accident to sleepiness during driving. He had tried his best to keep

his eyes focused by opening the drivers' window in the freezing cold of January but in vain. When his eyes opened, the bus had already gone off the track to a point where no attempt could prevent it from falling down the road.

The National Highway Traffic Safety Administration (NHTSA), USA estimated that driver fatigue and sleepiness were involved in an average of 56,000 vehicle crashes per year in the United States in the mid-1990s, approximately 1550 of which resulted in fatalities.¹ Although no systematic studies have been conducted in Nepal so far in relation to this, there are anecdotal evidence like the one just described that many a times road traffic accidents, especially highway accidents, are the direct consequence of sleeping at the wheel and probably stands in parallel to drunken driving and excess speeding in the etiology of such accidents. And yet, this factor seems neglected while formulating highway safety programs. There are several potential factors contributing to driver fatigue ranging from cognitive factors such as attention and workload to

drugs and a variety of medical and psychological disorders. Quite a lot of medically prescribed drugs can induce sleepiness, which is why the doctor ought to advise the patient on the adverse effects of every medication, and all patients are well advised to read the information leaflet attached to every new drug. Excessive daytime sleepiness has been proven with benzodiazepines which are used as hypnotics, anxiolytics, antiepileptics, muscular tension relaxants, antihistaminics: especially 1st-generation ones used as antiallergic, barbiturates, opioid analgesics, antidepressants, antipsychotics, some antihypertensives and dopamine agonists. Among the medical disorders, sleep apnea syndrome deserves the first rank unequivocally and is accompanied by chronic insomnia, narcolepsy, chronic fatigue syndrome, depression, dementia, Parkinson's disease.²

In view of these findings, it seems reasonable to suggest that efforts to counter fatigue or drowsiness among drivers can yield important benefits. On one hand, there are measures which aim at identifying the potentially reversible etiology of excessive daytime sleepiness and treating them appropriately. A classical example would be that for a sleep apnea syndrome (SAS). Horstmann et al. found that in the SAS group 12.4% of all drivers had had motor vehicle accidents as compared to 2.9% in the control group.³ This study also shows that adequate treatment for SAS can reduce the risk of traffic accident due to sleepiness to at least one fifth. Continuous positive airway pressure (CPAP) has been found the most efficacious therapy for SAS.⁴ CPAP makes use of breathing air of a higher atmospheric pressure through a nasal mask. Higher pressure in the upper airways works like an air splint preventing respiratory tract collapse, thus precluding breathing pauses as well as arousal reactions and awakenings. This makes for quality sleep and consequently, for lower excessive daytime sleepiness and tiredness. Patients can often feel this beneficial effect in a matter of a few nights using the apparatus.

Sleep disorders clearly have potential implications for licensing procedures. It is obvious in view of passengers' safety that those drivers with sleep related disorders should be refrained from driving. However, the current policy of medical evaluation during licensing procedure does not include evaluation for a sleep related disorders unless the subject has sleep related complaints. And as long as the licensing requirements in several countries leave to the patients themselves to consider their suitability for driving in relation to sleepiness, there is no guarantee that even people with sleep disorders actually will refrain from driving. Hence it is imperative to objectively assess the individuals for sleepiness and the preconditions for falling asleep. By the use of such methods, important knowledge can be obtained regarding early signs, which may indicate a danger of falling asleep. Such knowledge can be used for information to drivers to pay attention to those signs, and stop driving when they occur.

One such objective measure is the use of Epworth Sleepiness

Scale (ESS).⁵ In ESS, the patient is asked to respond to a total of eight questions designed to indicate on a scale of 0 - 3 the likelihood of dozing off in a particular situation (reading, watching TV, as a passenger in a car, after meals). The score obtained by adding the numbers leads to a total. The average score ranges from 0-9 while scores above 10 demand sleep specialist's advice. Another such objective measure is the multiple sleep latency test (MSLT), the most widely used clinical verification of ESS. The test follows a precisely defined protocol in the sleep laboratory.⁶

Similarly, the next important consideration in this regard is the implication of measures against fatigue and sleep-related accidents which are basically of two types. They can either prevent drivers from falling asleep or developing fatigue while driving, or they can alert a driver or intervene with driving once a driver's performance is impaired. Thus, there is both primary and secondary prevention of such accidents.

Examples of primary prevention are information to raise drivers' awareness of early signs of fatigue or sleepiness, or warning systems detecting such signs. Various in-car warning systems are currently being developed and tested in various projects. Some systems are based on one single parameter of the driver or car, e.g. the head falling forward, eye closure, or abnormal steering wheel movements. Others, e.g., the system being developed in the EU project AWAKE, are based on multiple parameters regarding the driver's state, the vehicle, and the demands from the traffic environment.⁷ In addition, there seems a growing body of research aiming to identify the environmental stimulants that can best counteract drowsiness and restore the alert state. It was found that sounds and scents can be highly effective in this respect as shown by performance of the subjects on simulation driving exercises in their presence and absence and various products were designed subsequently based on this finding as a measure to prevent accidents.⁸

However, the possibility of negative impact of such safety systems in the drivers' behavior always exists when drivers can use them for staying awake instead and drive for extra long hours. Hence, an important future research need is field trials of such systems in order to assess their effect on drivers' behavior and crash risk.

Next in the primary prevention, is the adequate regulation of hours of service for professional drivers. Evidence from various simulation studies regarding effects of time behind the wheel and rest periods on driving performance reflect the importance of managing fatigue by regulating the working hours.^{9,10} For this reason, many countries have strict hours of service regulations e.g. EEC regulation number 3820/85 governs hours of service regulations in European Economic Area and similar regulations are in effect in USA (U.S. Federal Hours of Service) and Australia too.¹¹⁻¹³

To sum up, the estimates of the contribution of drowsiness and fatigue to the number of road crashes is often neglected

considerably, due both to under-reporting of these factors by drivers, and technical difficulty in investigating the problem. Preventing and treating the reasons for sleep behind the wheel may have considerable contribution in traffic safety. Therefore, the licensing authorities in co-operation with the medical profession should attend more closely to the issue of sleep-related issues/disorders and their implications for driving in cases of notoriously high risk. The police and other enforcement authorities need appropriate knowledge and procedures to detect drivers at risk of falling asleep while driving. Considering the increasing number of road traffic accidents day per day¹⁴, it is a need of the hour to detect drivers possibly at risk, and to take appropriate precautions in terms of education, advice and treatment regimes, as well as restrictions on licensing.

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