

Effect of glare on night time driving in alcoholic versus non-alcoholic professional drivers

Nishit Gupta, Hem Lata, Amandeep Kaur

Department of Physiology, Dayanand Medical College and Hospital Ludhiana, Punjab, India

ABSTRACT

Context: The use of alcohol during nighttime driving may affect recovery from glare leading to increased traffic accidents. **Objective:** To compare the glare recovery time in alcoholic versus non-alcoholic drivers. **Materials and Methods:** Alcoholic ($n = 25$) and non-alcoholic drivers ($n = 25$) were subjected to glare recovery test and they also filled a questionnaire about the nighttime driving. **Results:** The glare recovery time got prolonged in alcoholic drivers and they also complained of more problems during nighttime driving as compared to non-alcoholic drivers. **Conclusions:** The use of alcohol delays recovery from glare during nighttime driving. This can have considerable implications for developing countries in improving regulations for driving licensing.

Key words: Alcohol, driving, glare recovery

INTRODUCTION

Driving requires effective coordination of visual, motor and cognitive skills. Visual skills are pushed to their limit at night by decreased illumination and by disabling glare from oncoming headlights.^[1] Increased numbers of road accidents are being reported under nighttime driving throughout the world.^[2-4]

Nighttime driving is identified as one of the six areas for substantially reducing fatalities in India according to a recent report submitted to Government of India.^[5] The risk of accidents at night is 40% higher than during the day.^[4] The number of people driving at night time has increased tremendously in the last 5 years due to increased competition, to meet work deadlines etc.^[3] Many countries have imposed nighttime driving restrictions, especially for

alcoholic professional drivers.^[2,6] Alcohol tends to affect the speed at which iris constricts and dilates. A driver that has been drinking alcohol cannot adapt as quickly to oncoming headlights. In studies in India, alcohol was involved in 22-29% of nighttime crashes and 35% of randomly checked drivers on the road at night were found under the influence of alcohol.^[4] Throughout the world, alcohol has been reported to impair driving, leading to increased road traffic accidents.^[7-9]

Glare recovery time (GRT) is an important, convenient and noninvasive method for evaluating the driver's ability as to how fast he recovers from the after effects of temporary blindness. Glare is defined as a "harsh uncomfortably bright light". GRT is a measure of the speed with which the visual system regains function following exposure to bright light.^[10] The glare during nighttime driving affects the driver's performance and hence increases the risk. Nighttime glare can make drivers temporarily blind on the road at night. Increased glare sensitivity has been found to be a risk factor for traffic accidents.^[4,11]

The glare recovery process can take many seconds or even minutes when the new light level is considerably dimmer than the previous level. During this time, the eye remains relatively blind to the detail. But following alcohol ingestion, these changes in vision may last even 30-50 percent longer. The integrity of the retina is disturbed by alcohol, the adaptation process is retarded and the

Address for correspondence: Dr. Hem Lata,
Department of Physiology, Dayanand Medical College and Hospital,
Ludhiana, Punjab - 141001, India.
E-mail: hembadyaldr@rediffmail.com

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recovery is prolonged.^[12] However, non-retinal mechanism may also be involved.^[13] The comparison of glare recovery time of alcoholic versus non-alcoholic professional drivers will provide information on the adaptability of these drivers in nighttime driving in Indian perspective. Very few studies are available comparing the glare recovery time of alcoholic and non-alcoholic professional drivers. Investigation of the visual elements of safe driving environments may be of great benefit to society. Hence, this study was planned to evaluate the glare recovery time of these professional drivers.

MATERIALS AND METHODS

This prospective study was done in fifty subjects. All the subjects were professional drivers who have been driving for at least 5 years with minimum frequency of three times a week night time driving, belonging to 25-60 years age group. The subjects were divided into two groups of twenty five subjects each.

Group A ($n = 25$) consisted of alcoholic male professional drivers who consumed at least three standard drinks of alcohol per day. The term “standard drink” refers to the quantity of alcohol in one 5 ounce glass of wine (12% alcohol by volume), 1½ ounces of spirits (40% alcohol by volume), or a 12 ounce glass of beer (5% alcohol by volume).^[14] Group B ($n = 25$) consisted of non-alcoholic male professional drivers, who never consumed alcohol. All subjects having normal corrected visual acuity were included and wore their normal prescription spectacles during the study. A written informed consent was taken from all the drivers. The study was approved by Institutional Ethics Committee.

Subjects not having normal corrected visual acuity, suffering from eye disorders, taking any medication which can affect psychomotor functions, suffering from any disease or disorder affecting psychomotor functions were excluded.

Glare recovery time was recorded using “Glare recovery tester” model GT-991 (Medicare, Chandigarh; India). The subject was made to sit two meters away from the equipment. The person measuring the glare was blind to the assigned group of the subject. A high beam of light was focused on eyes of the subject for a shorter and fixed period of time (two seconds). As soon as the light stimulation was over, a word was displayed on for the subject to read and subsequently the digital clock started counting time. On reading the word, the subject pressed the button, clock stopped counting and word disappeared. To test his ability to read correctly, the subject was asked to tell about the word which was displayed to him. If it was found to be

correct, the time thus displayed on clock was considered to be the ‘time of recovery from glare’. The subject was given the opportunity for a few practice trials before actual readings. Average of three glare recovery time readings were counted.^[10] Same procedure was repeated on each subject and glare recovery time was recorded after focusing the beam of light for five seconds as well. Here also, average of three glare recovery time readings were taken.

A questionnaire was administered to the subjects. One of the items in the questionnaire was based on De Boer scale which is the most commonly used scale used in headlamp glare research.^[6] Analysis of variance (ANOVA) and Chi-square tests were used to analyse the data. A P value of < 0.05 was considered as statistically significant.

RESULTS

The frequency of night time driving was comparable in both the groups. The average age was significantly more in group A as compared to group B. Similarly the driving experience in years and per day was significantly more in group A as compared to group B [Table 1].

The glare recovery time was significantly delayed in group A as compared to group B after 2 seconds as well after five seconds of projecting of beam of light. The recovery happened almost in double the time in alcoholic drivers as compared to non-alcoholic drivers [Table 2].

About 24% of the alcoholic drivers reported that they had problems during night time driving, while none of the non-alcoholic drivers reported any problem during night time driving. All of the alcoholic drivers (100%) and majority of non-alcoholic drivers (80%) felt that night time driving is more difficult than day time driving [Figure 1]. Responding

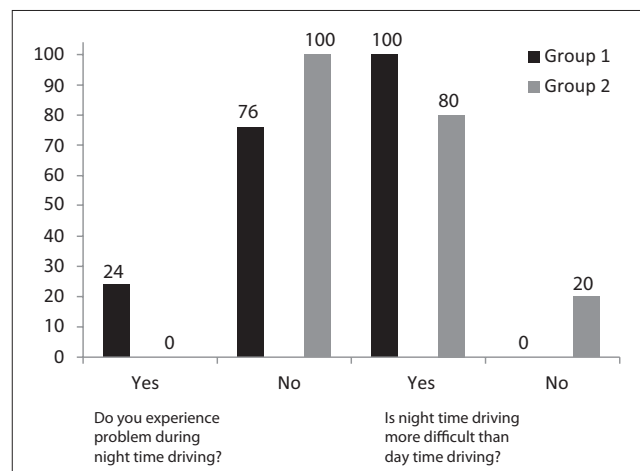


Figure 1: Responses of drivers in both groups

Table 1: Demographic and driving parameters in both groups (mean±SEM)

Parameter	Group A	Group B	P value
Age (Years)	37±9.06	31.04±7.89	0.019*
Driving experience (in years)	13.72±1.47	9.20±1.07	0.016*
Hours in day time driving	6.08±0.05	4.64±2.36	0.039*
Frequency of night time driving (days/week)	6.48±1.26	5.96±1.72	0.23

*Statistically significant

Table 2: Glare recovery time in both groups

Groups	Glare recovery after projecting beam of light for 2 seconds	Glare recovery after projecting beam of light for 5 seconds
A	11.9±1.46*	27.04±2.83*
B	5.44±0.42	14.12±1.02

Values in mean±SEM in seconds, *P<0.001 as compared to group B

to the query that how do they feel when a vehicle headlamp is approaching, alcoholic drivers (64%) described it as unbearable or disturbing. Non-alcoholic drivers felt it as just right or satisfactory.

DISCUSSION

In our study the average age was more in alcoholic drivers. This may be related to the fact the consumption of alcohol starts later in this profession. This fact is also supported by the more years of experience in driving in alcoholics as compared to non-alcoholics. Earlier studies mentioned that age can affect glare, but only after fifty years of age.^[11] The subjects in our study are in age group of 30-40 years; thus nullifying the limitation of confounding factor of age. The frequency of night time driving is comparable in both the groups.

The findings of present study indicate that the recovery from glare is significantly delayed in alcoholic drivers as compared to non-alcoholic drivers. The time to recovery was almost double in alcoholic drivers as compared to non-alcoholic drivers. The delayed recovery contributes to traffic accidents in nighttime driving as reported earlier too. The number of road traffic accidents is highest in India; hence this finding assumes a great importance.^[15]

This fact is further strengthened by the responses of drivers to the questionnaire. The alcoholic drivers reported problems at night time driving as compared to non-alcoholic drivers. All of the alcoholic drivers reported that night time driving is more difficult than day time driving. Even 80% of non-alcoholic drivers reported the same. Alcoholic drivers were more disturbed with approaching headlamps of a vehicle, while non-alcoholic drivers felt it as satisfactory or

just right. These findings indicate that alcohol impairs night time driving and alcoholic drivers face more difficulty during night time driving.

With the recognition that road safety needs to focus on reducing drinking and driving, many developed countries have designed and implemented a number of coordinated, integrated and sustainable licensing programs based on scientific research. Based on ongoing efforts to reduce the problem, it is important to change strategies and policies to reduce use of alcohol during driving in developing countries. A number of countries have nighttime driving restrictions especially for alcoholic professional drivers and most of the USA, Canada and European countries have now adopted Graduated driver licensing schemes based on advantages of these restrictions. These restrictions have decreased number of nighttime accidents in these countries.^[2] The findings can be advisable for traffic safety, if simple tests for contrast and glare sensitivity need to be implemented for requirements for a driver's license in our country. The concept of nighttime driving restrictions can also be helpful in reducing the number of vehicular accidents.

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