Original Article

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Assessment of Visual Function of Truck Drivers Travelling on National Highway of Central India: A Prospective Study

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Abstract

Introduction: Truck drivers are most responsible and simultaneously most vulnerable for highway accident. This might be due to several reasons, but the impaired visual function can be one of the major causes for mishaps.

Purpose: The purpose of the present study was to assess and analyze the visual function of drivers on national highway (NH).

Materials and Methods: The prospective study was done on drivers passing through NH 200 at Bilaspur (C.G.). Drivers were examined for visual acuity, color vision, and fields.

Results: Totally 1041 drivers were examined out of which 834 (80.11%) were found fit for driving. 196 had refractive error (18.82%), 11 cataract (1.05%), 3 corneal opacity and 2 squint were noted. 14 (1.34%) drivers had defective color vision.

Conclusion: According to the present criteria 20% drivers were unfit; in India criteria for driving safely is to be revised and regular monitoring and better visual examination parameters should be given more importance for issue and renewal of driving licenses.

Key words: Assessment, Drivers, Visual

INTRODUCTION

India has large and diverse transport industry. It caters to the needs of 1.1 billion people. In 2007, the transport sector contributed about 5.5% to the nation's Gross domestic product, with road transportation contributing the major share. India as a developing nation has a vast and exhaustive network of national highways (NH) connecting various parts of the country. Transportation of goods in India is mainly dependent on roads. Road transportation carries almost 90% of the country's passenger traffic and 65% of its freight. The India's highway network density is 0.66 km of per square kilometer of land which is similar to that of the United States (0.65) and much greater than China's (0.16) or Brazil's (0.20).[1]

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Safety on highways depends on the drivers of the heavy motor vehicle driving to the fullest in the highways.

Truck drivers are most responsible and simultaneously most vulnerable for highway mishaps. They are responsible for their own and live of others as well, on the road.[2]

Our study was conducted in association with Bilaspur traffic police and Bilaspur truck owner association.

In this study, we assessed the visual function of drivers on NH 200 at Bilaspur (C.G.).

MATERIALS AND METHODS

The protocol was approved by the local ethics committee and written informed consent was obtained from each patient. The study was prospective in design. The study was done on all the truck drivers passing through NH 200 at Bilaspur (C.G.). Inclusion criteria were all the truck drivers passing through the NH 200 at Bilaspur between 9 am and 5 pm between the dates of 2/04/2010 and 6/04/2010.

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All the drivers were examined by an ophthalmologist for visual acuity (Landolt's C, Snellen's charts), color vision (Ishihara plates) and visual fields (confrontation method). Drivers, having unaided or with glass visual acuity less than 6/6 in either eye were examined by pin hole to read the Snellen's chart.

The vision requirements for driving safety in India is BCVA 6/18 binocularly data as obtained from report vision requirements for driving safety prepared for International Council of Ophthalmology (ICO) 30th World Ophthalmology Congress, Brazil, 2006.[2]

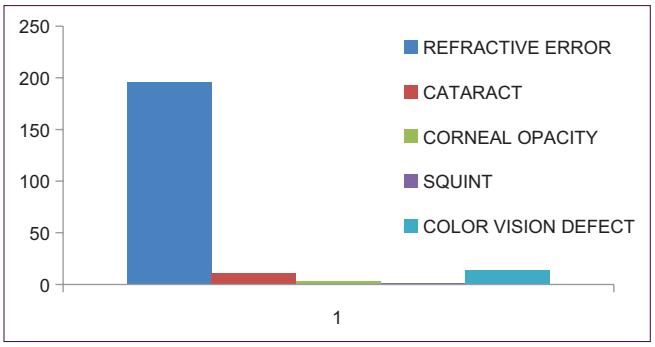

Figure 1: Visual defects in truck drivers

RESULTS

Totally 1041 drivers were examined out of which 834 (80.11%) were found fit for driving.

Criteria adapted as per data obtained for India from a report prepared for ICO 30th World Ophthalmology Congress, Brazil, 2006.[2]

The mean age of drivers was 32 years (range 18-60 years). Figure 1 is showing the results of visual function defects.

196 drivers had refractive errors (18.82%). Among 196 refractive errors, 144 (73.46%) were not wearing any corrective glasses while 52 (26.53%) were wearing under corrected glasses.

Nearly 11 (1.05%) drivers had cataract. Three drivers had corneal opacity and two had a squint. 14 (1.34%) drivers had defective color vision.

DISCUSSION

ICO recommends various visual functions to be tested. Report prepared for the ICO at the 30th World Ophthalmology Congress, Sao Paulo, Brazil, February 2006 suggested criteria and rules.[2] It stresses the need for binocular (both eyes open) measurements and the need for a gray zone in which decisions will be based on individual consideration, rather than on the application of strict numerical criteria. It also stresses the interaction of visual and non-visual parameters. For visual acuity, the commonly used threshold of 20/40 (0.5, 6/12) is accepted. For visual fields, a binocular field of at least 120° horizontal and 40° vertical is suggested. Contrast sensitivity screening is listed as desirable.

There is a relationship between age and driving safety according to Keltner and Jhonson.[3] The Department of Motor Vehicles Driver Record Study at California reported during the period of 1972-1974, an incidence of two accidents per 100.000 miles in 20-year old drivers. This number decreased to 1/100.000 for the age group 30-60 years and increased again after that age to reach 2/100.000 at the age of 70 years. Younger drivers are prone for speeding, whereas older persons are probably more easily distracted or fail to appreciate and respond to a potentially dangerous situation. These factors are all non-visual. The person's physical condition, hearing and slowing of reactions with age, play a definite role.[4]

Visual acuity is the visual parameter that is most easily and, therefore, most widely measured. It is often considered for a gross measure of vision. Its limitation is that it only tests the central macular area. For optical problems like defocusing or opacities, it is adequate. For retinal problems which are quite prevalent in the older population, visual acuity is only a partial measure since the foveal function does not predict perifoveal function. The 20/40 (0.5, 6/12) standard is the criterion most widely used. We believe this to be reasonable, not because one becomes an unsafe driver at 20/50 (0.4, 6/15) but because it includes a safety margin for adverse conditions.

Szlyk *et al.* compared the driving performances of 20 patients with juvenile macular dystrophy (Stargardt disease or cone-rod dystrophy) and visual acuity between 20/40 and 20/70 with 29 control subjects with normal vision. The ratio of individuals involved in accidents in the group of central vision loss was comparable to that of the control group.[5]

Contrast sensitivity may be reduced due to optical factors like cataract. Contrast problems may also result from retinal problems (age-related macular degeneration, glaucoma, etc.) that are also common among the elderly. If the contrast sensitivity loss is caused by optical problems (defocus, scatter), both visual acuity and contrast sensitivity will be affected. Brabyn *et al.* showed that some people in an elderly population may have 20/20 (1.0, 6/6) acuity on a high contrast chart in good illumination, but will easily drop to 20/200 (0.1, 6/60) or below with low light, low contrast and glare.[6] Mäntyjärvi and Tuppurainen suggest to include simple tests for contrast sensitivity and glare sensitivity in the requirements for a driving license in older drivers.[7]

In patients with lens opacities, the problems are not only the reduction of central vision and the visual field restrictions. Poor contrast sensitivity and glare also play a very important role. Owsley *et al.* studied the impact of cataract on driving in an older population (274 with cataract and 103 cataract free drivers).[8] Drivers with a history of crash involvement were eight times more likely to have a serious contrast sensitivity deficit in the worse eye (defined as a Pelli Robson score of 1.25 or less) than those who were crash free. They concluded that severe contrast sensitivity impairment played a major role in car accidents even when it was present in only one eye.

Wood *et al.* simulated three conditions of visual impairment in 14 young, visually normal, individuals: Monocular vision, cataract and peripheral field restriction. Using modified swimming goggles the extent of visual fields, and low contrast visual acuity were significantly decreased. In this study, simulated cataract caused the greatest reduction in driving performance, followed by binocular visual field restriction even though the drivers still satisfied the visual requirements for driving licensure. Monocular vision did not significantly affect the driving performance.[9]

Glare sensitivity may result from optical problems, such as cataract, or from retinal problems. In the first case stray light and disability glare are important; in the latter case, glare recovery time is important. A recent European study validated the use of a new stray light meter in an international population study.[10]

The Guidelines of the European Commission have dropped color vision requirements.[11] They are still in use in some states in the USA, in Bulgaria, Columbia and provinces in Canada. Studies by Verriest *et al.* have shown that abnormal color vision is not incompatible with safe driving.[12] The problem of recognizing traffic lights is overcome by the standardized position of the different lights, appropriately chosen colors and in some countries by the differences in their sizes.

Our study has several limitations. In our study, Snellen's acuity chart was used due to non-availability of logMAR chart. Contrast sensitivity (Pelli Robson chart, MARS hand held chart), Glare sensitivity, diplopia, night vision tests can also be included. Contrast sensitivity testing was not done which is the limitation of our study.

CONCLUSION

- According to the present criterion ≈ 20% drivers were unfit; in India criteria for driving safely is to be revised and modified including other criteria (visual field, contrast sensitivity) which most of the western countries have.
- Abnormal color vision is incompatible with driving safely, but the problem can be overcome by the standardized position of traffic lights.
- Regular monitoring and better visual examination parameters should be given more importance for issue and renewal of driving licenses.
- Frequent ocular examinations are recommended for older drivers.
- Ocular examination for drivers should be more frequent in various parts of different highways in the country to increase the safety margin of our NHs.

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