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Original Article

VISUAL PROBLEMS OF NEW MALAYSIAN DRIVERS

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ABSTRACT

Purpose: The objective of this study was to determine the prevalence of poor visual acuity, colour blindness and visual field defect of new Malaysian drivers. **Methods:** A total of 3717 new drivers (50.2% males and 49.8% females) age 19±6 years, voluntarily participated in this study. Standard optometric apparatus such as LogMAR Charts, Ishihara plates and HandHeld Bernell Perimeter were used and standard procedures were applied. **Results:** The visual examination showed 6.7% (n=250) of subjects achieved less than 0.3 LogMAR with better eye whilst 2.2% (n=83) had failed the Ishihara Test (2.1% males and 0.1% females). Most of the affected drivers were deutanopia. Only 2094 subjects had their visual field using a mobile Handheld Bernell Perimeter. 1.72% (n=36) subjects have less than 120 degrees of peripheral field of vision. **Conclusions:** The visual status among new Malaysian drivers needs to be taken seriously to ensure safe driving. Other factors such as colour vision and visual field screening have to be considered seriously when evaluating the visual performance of a driver. Good visual performance is indispensable for safe driving.

Keywords: Visual acuity, colour defect, visual field, driving.

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INTRODUCTION

Road accidents in Malaysia have increased in recent years.¹ Jacobs and Aeron-Thomas noted that Malaysia has the highest number of road accidents in the world. The main causes of road accidents are road condition, traffic lights, drivers' factor, vehicle condition, speeding, road lighting and others. Despite many attempts by the government in improving all the factors mentioned especially road quality and road lightings, the accident rate remain high over the years.

Many medical conditions, including vision impairment are associated with road traffic accidents.³⁻⁸ Vision plays one of the most important role in safe driving, it was often said that approximately 90% to 95% of the sensory input to the brain required for driving comes from vision.⁹ Thus at present, vision is a requirement in the certification of driving licenses in many countries. However, the importance of visual performance is not supported by the wider literature and there is little evidence to suggest that impairment in vision is the main factor for crashes.

Vision requirement for driving

Every country in the world has their own visual standard criteria for vehicle drivers. The Malaysian Road Transport Department (RTD) vision guideline for driving is minimum of Snellen 6/60 in each eye without glasses and Snellen 6/12 in the best eye with corrective glasses, and a pass in the Ishihara Test. There were no standards for visual field for drivers so assessment for field of vision is never emphasized. The strict visual requirement in Malaysia has been a standard to RTD since eye screening was made mandatory before drivers' license can be issued. The criteria set for each country would depend very much on the flow of road traffic, the conditions of the road and also the motor vehicle accident rate.

Visual performance of drivers is usually tested before the drivers' license is issued and the vision performance is not repeated after that. If the drivers acquired certain eye disease at a later stage of life the license will not be revoked for that matter. The

driver will be expected to self limit themselves from driving at their own risk. Renewing of drivers' license can be done easily as no questions are asked regarding the current health of the driver.

Many literatures may deem that stringent visual performance might not be too helpful in safe driving.¹⁷⁻²⁰ There are other factors which could definitely contribute to crash too such as fatigue, lack of focus, poor vehicle maintenance and others. Much effort has been put in to study these situations but the importance of visual performance is being neglected. This study aimed to determine the prevalence of poor visual acuity, colour blindness and visual field defect of new Malaysian drivers. The data of these parameters will indicate the effectiveness of the screening tests of our RTD in detecting those who are unfit to own driving license.

METHODS

A cross-sectional study on the prevalence of visual acuity in new drivers was conducted at four different zones in Malaysia i.e. North, South, East and West of Malaysia. Each zone comprised of several states. This study was carried out in 26 driving schools appointed by the RTD office in the zones. Subjects recruited were 1865 males and 1852 females; age range 16 to 74 years old (average age 19±6 years). The subjects were candidates of the driving school who has passed in their visual test conducted by the RTD and were waiting for their turn for the practical driving test. The RTD's visual test comprise of a series of images shown on computer screen which tested on vision and colour perception. All of these candidates were asked to participate in this study after a short briefing on the study was given by the chief investigator. All the candidates voluntarily enrolled in this study and none rejected or was forced into this study. The subjects were asked to follow the flow of the study protocol whereby the first parameter measured were unilateral VA using LogMAR EDTRS Chart, secondly; colour vision test using Ishihara 24-Plates; and lastly testing the field of view using the mobile visual field analyzer; Bernell Handheld perimeter. Bernell Handheld perimeter is a mobile instrument that appears like a black hemisphere tray that allows measurement of the horizontal and vertical perimeter. The tray is held under the subject's nose and the operator used a black 3 mm target wand to test the subject's field of view. All these tests were done using standard methods and procedures by specific investigator throughout the whole study. Approximately 15 minutes were allocated for each subject to complete the whole study. The study was conducted in a general illuminated room provided by the driving school. The illumination of the room was at 600 lux. The investigators were all fully qualified optometrist and were briefed on the procedure to ensure consistency throughout the whole study. Data management and analysis were done using the SPSS (Version 15.0).

This study followed the tenets of the Declaration of Helsinki in which informed consent was obtained from subjects after explanation of the nature and possible consequence of the study. This research was approved by the Ethical Committee, Hospital Universiti Kebangsaan Malaysia, UKM (Ref: FF-071-2007).

RESULTS

Table 1: Visual parameters of new drivers in Malaysia

| Parameters | Total subjects | N fail (False negative) | N pass (True negative) | % Fail | Negative predictive value |
|--|----------------|-------------------------|------------------------|--------|---------------------------|
| Visual Acuity (VA less than 0.3 LogMAR) | 3717 | 250 | 3467 | 6.7 | 93.3 |
| Colour Vision (Fail more than 4 Ishihara Plates) | 3717 | 82 | 3635 | 2.2 | 97.8 |
| Perimetry (Horizontal visual field less than 120°) | 2094 | 36 | 2058 | 1.7 | 98.3 |

Visual acuity

The subjects were recruited after they have passed the visual test conducted by the RTD. In this study, the remaining unfit subjects whom the RTD failed to detect showed 6.7% (n=250) of subjects achieved less than 0.3 LogMAR with best eye. These were actually false negative errors of the RTD screening tests.

Colour vision

83 drivers (2.2%); 79 males (2.1%) and 4 females (0.1%) failed the Ishihara test where they failed to read more than four from the 24 plates shown. Most of the defects were severe deutan followed by mild deutan. One subject suffers from mild protan and another one subject with total colour defect.

Table 2: Types of colour defects using the Ishihara Plates

| Type of defect | Male (N) | Female (N) |
|----------------|-----------|------------|
| Mild deutan | 30 | 1 |
| Severe deutan | 47 | 3 |
| Mild protan | 1 | 0 |
| Severe protan | 0 | 0 |
| Total defect | 1 | 0 |
| TOTAL | 79 (2.1%) | 4 (0.1%) |

Visual field

The average horizontal peripheral visual fields for all subjects were in the range of 56° to 176°; average visual field was 147.6±10.5°. The normal standard for visual field is a minimum 120° or more. Only 36 (1.7%) subjects had horizontal visual field of less than 120°.

DISCUSSION

In this study it was found that 6.7% of new drivers had visual acuity of less than 0.3 LogMAR with their best eye. This value indicates that some Malaysian drivers might have substandard visual acuity presented during the driving test. A study by Hoe describes 28.3% of Malaysian drivers (age 22-58 years old) were myopic, but only 22.2% had their myopia corrected with glasses. It may reflect that these new drivers that was found visually incompetent for driving in this study might have uncorrected myopia and not being bothered about it.

According to RTD official portal, up till December 2009, there were 11,697, 306 licensed vehicle drivers on road. From this study, it was found 6.7% of new drivers failing to achieve the required visual acuity; this could translate to almost 780,000 Malaysian drivers having unsatisfactory vision for driving. It will be an utmost importance for the government's to enforce the potential driving candidate to have their refractive error corrected as mandatory before drivers' license can be applied. This may reduced the numbers of visually incompetent new drivers on the road.

Although vision has always been quoted as the fundamental component of safe driving, visual acuity was claimed as weakly related to crash involvement.¹⁰ Owsley also claimed that peripheral vision deemed to play a more critical component of vision in driving. However DeCarlo's study on some individuals with age-related maculopathy related that visual acuity was still important in determining if individuals dare to drive. It is unclear whether the combination of other types of visual functions such as colour defect and limited field of view would also have a significant impact on driving safety and performance.

In this study, only 2.2% of new drivers have congenital colour defect, most of the subjects were males. Since congenital colour defects are inherited as X-linked recessive disorder, this number is expected to rise in years to come. In a study looking at colour blindness population, it is known that the gene frequency can increase from 0.02-0.04 in 'primitive' populations to 0.07-0.09 in Caucasoid populations, possibly as a result of a selection relaxation.¹¹ Colour vision assessment done using the Ishihara Plates was found to be able to filter more subjects with colour defect compared to the colour vision screening software used in driving schools. Another study done in 2006 on 1427 Medical Students and Health Personnel in Malaysia showed 3.2 % had colour vision deficiencies which were more obvious in males compared to females (6.7% vs 0.4%).¹² This value was found to be similar to that in this study.

In many other countries, colour vision is not an important criterion in getting drivers license.¹³ The Europe Commissioner guidelines have dropped the need for colour vision (EU 2005) as the rate of accidents was low in their states. Only countries like Bulgaria, Columbia and Canada¹⁶ still adhere to the need of colour vision assessment for new drivers. Owsley has also found that colour vision deficiency by itself is not a threat to safe driving. However, the relevancy of colour assessment very much depends on the road conditions, the use of traffic lights and the weather conditions. Colour deficiency in drivers should be

evaluated further to determine the severity and type of colour defect.

The visual field test is not a mandatory test for drivers in Malaysia. In this study, we introduced a mobile visual field instrument, Bernell Handheld Perimeter. This instrument has been found to have high reliability and repeatability when compared to the Humphrey Field Analyzer II.¹⁴ It is affordable and easy to handle during screening sessions. Only 1.72% of the new drivers were found to have less than 120° of horizontal visual fields.

In this study, three important parameters in visual screening were regarded as essential for safe driving. The visual acuity coupled with the ability to discriminate colours and having a sufficiently wide field of view are factors needed for good driving. As Malaysia holds one of the highest rated countries with motor vehicle accidents, all parameters in visual screening should be taken seriously.

Since the statistics for accidents are always on the rise despite having many preventive measures like good roads, lightings, better driving conditions and vehicle safety upgrading, it might be worthwhile to have a stringent vision test to allow only visually competent drivers to be on the road. Since most of the drivers have visual acuity of lower than the required standard, it is believed a comprehensive eye examination before applying for driver's license should be made mandatory. This is to make sure that all new drivers pay utmost attention to have good vision before they are allowed to have driver's license.

Candidates with colour vision defect should be strongly advised to assess their severity and type of defect in a more comprehensive way. Being a deuteranomalous or deutan will not pose as much danger as a protanomalous or a protanope.¹⁵ Although Cumberland¹⁶ found congenital colour defects confer no functional disadvantages in relation to educational attainment or unintentional injury, thus challenging the rationale for screening colour vision. However, it is generally accepted that colour vision deficient adults can drive safely if they are able to discriminate colours by using cues.¹⁷

Visual field is important in driving especially the horizontal visual field.¹⁸ Many studies have shown the narrowing of the peripheral visual field can disturb the driving performance.¹⁸ Moreover, visual field testing may help to detect certain ocular diseases which may appear symptomless. However, a study on some drivers with hemianopia or quadrantanopia showed fitness to drive compared with age-matched control drivers.²⁰

It is important to emphasize the importance of having a stringent test in assessing the visual performance of new drivers to ensure safe driving. A more effective tool in assessing candidate's visual performance should be considered.

CONCLUSION

The known prevalence of visual defect among Malaysian new drivers might portray some importance. It appears that many drivers are not aware that good vision is important to ensure safe driving. Other factors such as colour vision and visual field screening have to be considered seriously when evaluating visual performance of a driver especially in commercial drivers. Although many present literature supports that impairment in vision, is not the sole factor responsible for crashes,¹⁰ it is generally accepted that basic visual performance is still essential for safe driving. The importance of having good vision is the key for safe driving need to be emphasized to all responsible road users.

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