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Original Article

PREVALENCE OF COLOUR VISION DEFICIENCY AMONG MEDICAL STUDENTS AND HEALTH PERSONNEL

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ABSTRACT

A survey of colour vision deficiency among 1427 medical students and healthcare personnel in Seremban revealed a prevalence of 3.2% with a marked male predominance (males 6.7%, females 0.4%). In view of the potential difficulties faced by such personnel in clinical works, early detection of this deficiency allowed appropriate counselling.

Keywords: Colour blindness, prevalence, health care workers
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INTRODUCTION

The prevalence of deficient colour vision is reported to be 8% in White UK men and 0.5% in women.[1] In a study of 1214 primary school children in Petaling Jaya, Selangor, the prevalence of colour vision deficiency was found to be 2.6% (males 4.8%, females 0.2%).[2] The commonest form of deficient colour vision is red-green deficiency; total colour blindness is very rare. Colour vision defects are inherited as X-linked recessive disorder, which explain its predominance among the males. Even though no specific treatment is available for those affected by this disorder, it is helpful to detect it so that those affected can be counselled about future occupation. The importance of detecting colour vision deficiencies among health personnel is not well appreciated in Malaysia. Thus, we have conducted a study to document the prevalence of this problem among the health personnel and medical students.

METHODS

Medical students from International Medical University, and healthcare personnel from Hospital Seremban were invited to participate in a study to determine the prevalence of colour vision deficiency. The colour vision deficiency was determined using the 24-plate Ishihara's Test of Colour Vision.[3] The colour vision testing plates are held at 75 cm from the person and tilted at right angle to the line of vision. The test was done in a properly lighted room resembling to the effect of natural day light. The person was asked to read the numbers seen on the test plates 1 to 17, and the time given for telling the number was less than 5 seconds. An assessment of the reading of plates 1 to 15 determines the normality or defectiveness of colour vision. If 13 or more plates are read correctly, the colour vision is regarded as normal. If only 9 or less than 9 plates are read correctly, the colour vision was regarded as red green deficient. The plates 16 and 17 are used to differentiate protan and deutan types of colour vision efficiency. An informed consent was taken from all persons. Ethical approval for this study was obtained from the Ethics Committee of International Medical University.

RESULTS

A total of 1427 persons (658 medical students from International Medical University and 769 health care personnel from Hospital Seremban) participated in this study. The gender and ethnic distribution of the study subjects is shown in Table 1.

Table 1: Sex-specific prevalence of deficient colour vision by ethnicity and category of personnel

Colour blindness	Males Normal vision	Red green deficiency	Females Normal vision	Red green deficiency
Ethnic group				
Malay	275 (91.7)	25 (8.3)	386 (99.5)	2 (0.5)
Chinese	243 (95.3)	12 (4.7)	300 (99.7)	1 (0.3)
Indian	63 (92.6)	5 (7.4)	115 (100)	0
Category				
Medical students	275 (94.8)	15 (5.2)	367 (99.7)	1 (0.3)
Doctors	33 (97.1)	1 (2.9)	50 (100)	0
Medical assistants*	259 (91.8)	23 (8.2)	NA	NA
Nurses*	NA	NA	356 (99.7)	1 (0.3)
Others**	14 (82.4)	3 (17.6)	28 (96.6)	1 (3.4)

NA= not applicable
* including trainees
**attendant, dental assistant, dentist, dietician, physiotherapist, pharmacist, pharmacy assistant, laboratory technician

The mean age of the respondents was 26 years (range 18-57 years). In the sample studied, 45 persons (3.2%) were found to have red-green colour vision deficiency. The sex-specific prevalence of colour vision deficiency, by ethnicity and category of personnel, is given in Table 1. The prevalence of colour vision deficiency was more in males than females (6.7% vs 0.4%, $p<0.001$). The ethnic difference in colour vision deficiency was not statistically significant in both genders. The prevalence rates of colour vision deficiency by category vary from 0.3% (for nurses, all females) to 8.2% (for medical assistants, all males).

DISCUSSION

The term "colour blindness" commonly used in daily practice is a misnomer. To our best knowledge, we have not come across any person who is totally colour blind, i.e. he/she should appreciate everything in life as black and white only. Instead, all the persons diagnosed as "total colour blindness" by Ishihara Chart could identify the primary colours correctly when shown each colour individually. In addition to Ishihara colour vision test plates, other methods such Naegel anamaloscope test and Franseworth-Munsell hundred hue test are also available to test for colour vision. These two tests are more sensitive and accurate, but time consuming; thus, not suitable for mass screening.[4] The Ishihara test charts were chosen in this study because it is easier and quicker to perform; familiarisation with all the colours is not necessary since the answer given is in terms of numbers and not in terms of colours; the test is accurate for assessment of colour vision deficiency in mass screening.
The prevalence of colour vision deficiency in our sample of medical students and healthcare personnel was similar to reported rates in Western general population and healthcare workers.[1] Our study did not find statistical significant difference in the prevalence of colour vision deficiency by ethnicity.

It is well known that people who are deficient in colour vision adapt to their deficiency by using cues. In a population-based cohort study, Cumberland found congenital colour defects confer no functional disadvantages in relation to educational attainment or unintentional injury, thus challenging the rationale for screening.[5] It is generally accepted that colour vision deficient adults can drive safely because they can tell a stop sign by its shape and know which traffic light means "go" and which one means "stops" because they are always in the same order on traffic lights. However, technological changes (e.g. lower cost of colour printing, wide use of colour computer monitors) present additional problems for those with this deficiency.[6] Is the problem faced by these people merely a minor inconvenience?

For the healthcare practitioners, detection of certain clinical signs require unimpaired colour vision, such as cyanosis, jaundice, retinal changes, colour of body fluids (e.g. haematuria), and blood in vomitus. When compared with normal controls in the performance of clinical tasks requiring colour differentiation, those who are colour vision deficient tend to perform poorer.[7-12] The extent to which these difficulties translate into actual clinical errors in unknown. In our society where we are placing increasing emphasis on equal opportunity, people with colour vision deficiency need not face unnecessary discrimination.[6,13] However, early detection of colour vision deficiency is helpful for those embarking on a healthcare profession. For the colour vision deficient doctors, disciplines such as anaesthesiology, emergency medicine, pathology, microbiology and dermatology may pose difficulties but psychiatry and neurology are less problematic.

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