Color vision deficiency among a group of students of health sciences

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ABSTRACT

Color vision deficiency, most of the time remains an unnoticed problem; even many doctors/health professionals do not know the severity of their color vision deficiency and their disability. Some common difficulties reported by medical practitioners and students of health sciences were in recognizing- widespread body color changes (pallor, cyanosis, icterus, rashes, erythema of skin), colorful charts, slides, test-strips of blood and urine, body products: blood or bile in urine, faeces, sputum, vomitus, microscopy, oral and throat lesions, titration end-points, tissue identification (surgery) etc. The present study was undertaken to evaluate the presence of congenital color vision deficiency among the students of health sciences.

The study was carried out among the medical and dental male students of Nepal Medical College and Teaching Hospital (n = 215) from November 2, 2012 to December 4, 2012 with the help of Ishihara chart which was shown to all male participants and were asked to read the impressions in the color chart. The impressions perceived by a person with normal color vision were different from the impressions perceived by a person with color vision deficiency.

After careful screening, it was noted that among the study population (n = 215), 12 were color deficient (5.58% of our study population). Among them, one could not appreciate color (total color blindness according to the chart used), protanomaly was detected in 1, deuteranomaly in 3 and deuteranopia in 7 volunteers.

Students of health sciences must be made aware of their congenital color vision deficiency and its effects on their work. Screening enables the students and later the health professionals to become aware of limitations in their powers of observation and devise ways of overcoming them. The patient is protected from harm and legal action may be avoided when the health professional have adapted their practice to their deficiency. Medical/dental students and health professionals must be screened for color vision deficiency and advised about it, so that they can take special care in clinical practice.

INTRODUCTION

For the perception of color, the synergistic and harmonic functions of retina, different parts of the thalamus and cerebral cortex are essential. The world is colorful. The lash green wide fields, the brilliant colors of the flowers and butterflies, the gorgeous blue of the sea, the majestic colorful horizon during sunrise and sunset gives immense pleasure to our eyes. The faculty of appreciation of color is essential for our smooth daily activities. Especially students of health sciences and medical/dental practitioners, who lack this faculty partially or totally, experience a wide range of difficulty in their practice of medicine with a potentiality of errors. It is very difficult for a health professional to appreciate and evaluate the presence and extent of colored clinical signs eg. fresh blood in vomitus or stool, colored structure of bacilli in sputum stained by Ziehl-Neelsen method or biopsy sample stained by H-E stain. The students of health sciences must be made aware of their deficiencies and know their severity so that they can take special care in clinical practice and avoid litigation. The present study was undertaken to evaluate the presence of congenital color vision deficiency among the students of health sciences – the future practitioners to make them cautious about their color vision deficiency so that they can be more alert during evaluation of colored clinical signs. Medical/dental students and practitioners should be screened for the deficiency and advised about it, as the effects of color vision deficiency are crucial on decision-making in general practice and certain specialties.

MATERIALS AND METHODS

The study was carried out among the medical and dental students (age 19 to 26 years) of Nepal Medical College and Teaching Hospital (n = 215) from November 2, 2012 to December 4, 2012 with the help of Ishihara chart. This chart consists of polychromatic plates containing printed figures made up of colored spots on a background of similarly shaped colored spots. The figures are intentionally made up of colors that are liable to look the same as the background to an individual who is color-deficient.

All the colored plates of Ishihara Chart were shown to male participants and they were asked to read the

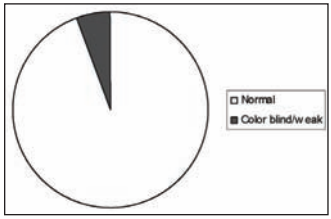

Fig. 1: Distribution of color blind/weak persons among the study population

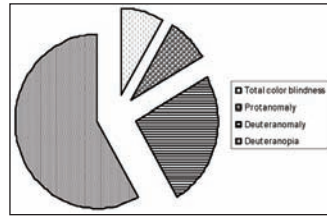

Fig. 2: Distribution of different types of color deficient individuals

impressions. The impressions perceived by a person with normal color vision were different from the impressions perceived by a person with color vision deficiency.

RESULTS

After careful screening, it was noted that among the study population (n = 215), 12 were color deficient (5.58% of our study population). Among them, one could not appreciate color (total color blindness according to chart used), protanomaly was detected in 1, deuteranomaly in 3 and deuteranopia in 7 volunteers (Fig 1 and Fig 2).

DISCUSSION

Color blindness is one of the common genetic disorders observed in all human populations. It is a sex linked recessive trait. The genes are located on the X chromosome within Xq28 band. It was reported that among the Jordanians, 8.7% of the males are color blind/weak.[1] Among the British male physicians, 8% were reported as color deficient.[2] Prevalence of color-deficiency in European Caucasians, Chinese and Japanese men are 8%, 4% and 6.5% respectively.[3]

The difficulties faced by the color deficient medical students and doctors in their work were documented where they expressed their own experiences,[4-7] and a few studies reported the inconveniences of color-deficient professionals in clinical and laboratory skills.[8-13]

Some common difficulties reported in medical practice and as students were in recognizing- widespread body color changes (pallor, cyanosis, jaundice, rashes, erythema of skin), colorful charts, slides, test-strips for blood and urine, body products: blood or bile in urine, faeces, sputum, vomitus, microscopy, mouth and throat lesions, impressions presented in the Ishihara chart, titration end-points, tissue identification (surgery). [14]

Studies among the British general practitioners revealed, person having mild color deficiency had fewer difficulties and having more color deficiency faced more difficulties. The works of Spandling revealed a wide range of difficulties experienced by color vision deficient person in their practice of medicine with a potentiality of errors.[14] Study of Campbell *et al* revealed the physicians with color vision deficiencies could not identify and out line properly the clinical sign in 10 photographs of which 8 were vomitus or stool of which 6 showed fresh blood) one skin rash and for 1 to mark the position of bacilli in sputum stained by Ziehl-Neelson method, whereas physicians with normal color vision did it easily.[15] Examination of histologic and histopathologic / microscopic sections relies upon differential colors provided by staining techniques, such as hematoxylin and eosin, to delineate normal tissue components and to identify pathologic alterations in test components. Given the prevalence of color deficiency (commonly called 'color blindness') in the general population, it is likely that this reliance upon color differentiation poses a significant obstacle for several medical students beginning a course of study that includes examination of histological slides. In the past, first-year medical students at Michigan State University who identified themselves as color deficient were encouraged to use color transparency overlays or tinted contact lenses to filter out problematic color. Recently, however, they have been offered a computer monitor adjusted to grayscale for in-lab work, as well as grayscale copies of color photomicrographs for examination purposes, grayscale images emphasize the texture of tissues and the contrasts between tissues as the students learn histological architecture, using this approach, color-deficient students have quickly learned to compensate for their deficiency by focusing on cell and tissue structure rather than on color variation. According to Rubin *et al*, besides the color-deficient students, gray scale photomicrographs may also prove instructional for students with normal (trichromatic) color vision, by encouraging them to consider structural characteristics of cells and tissues that

may otherwise be overshadowed by stain colors.[16]

Present study revealed 5.58 % of the study population as color weak/blind. Dargahi *et al* (2010) reported 2.40% of medical laboratory sciences students and hospitals' clinical laboratories' employees of 'Tehran University of Medical Sciences' as color-deficient.[17]

Study conducted by Shrestha *et al* (2010) reported, among the school going male students of Kathmandu valley, 3.90% had color vision deficiency.[18] Another study by Niroula and Saha (2010) reported prevalence of color deficiency in 3.80% school going boys in Pokhara, western Nepal.[19] These indicate that the awareness about the color deficiency is increasing in Nepal.

With increasing experience, doctors tend to make more use of intuition when making decisions while medical students are more likely to use analysis.[20] Students are therefore at a stage when they would be relatively open to advise about their congenital color vision deficiency and its effects on their work. Screening enables the student and later the doctor to become aware of limitations in their powers of observation and devise ways of overcoming them. As a result, confidence may be gained and anxiety avoided; an informed choice of career can be made; the patient is protected from harm and litigation may be avoided when doctors have adapted their practice to their deficiency. [21] Many doctors do not know the severity of their condition and tend to assume it is slight, and a few, as in the general population, do not know whether they have any disability, [22, 23] and the problem needs attention. Thus, it can be suggested that medical students and physicians should be screened for color vision deficiency and advised about it so that they can take special care in clinical practice.

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