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Original Research Article

A Community-Based Descriptive Cross-Sectional Assessment of the Pattern of Inheritance and Career Choices of Secondary School Students Screened for Color Vision Disorders

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Abstract

Aim: To ascertain the pattern of inheritance and career choices of secondary school students screened for color vision disorder.

Material & Method: The study is a community-based descriptive cross-sectional study involving public secondary school students from randomly selected schools in Bihar. The participants had a comprehensive ophthalmological eye examination and Ishihara color vision testing was carried out in a room with sufficient indirect daylight illumination or outdoors using the 24 plate 2009 edition.

Results: Mean age of students was 14.5 years. The prevalence of color vision disorders was 2.85 % (p-value 0.001). Majority of the students desired to be health workers (n=379; 42.1%). **Conclusion:** The majority of color-blind students expressed a preference for jobs that require color vision. To guarantee effective vocational counselling and choice, measures should be put in place to establish school eye screening programmes to educate and ensure that kids are checked for CVD at least once throughout secondary schooling.

Keywords: Career choices; Color vision disorders; Secondary school

Introduction

Congenital color vision deficiency (CVD) is common and affects ~ 5 to 6% of Indian males. [1-6] They are often diagnosed at the time of the pre-recruitment stage for a job [7] and they are not aware of their condition until then. [8] In some cases, they are diagnosed in an annual health screening, which makes it even worse than the pre-recruitment stage, as the individual's livelihood is immediately at stake. Thus, CVD diagnosis can have a negative psychological impact on their mental state [9,10] and can adversely affect job prospects. [11] They often end up putting considerable time and resources (financial and mental) toward an unattainable goal, [9,10] which results in considerable disappointment, despair, and agony. [12]

However, acquired color vision may occur at any age due to eye diseases or lesions elsewhere in the visual pathway, mostly unilateral and are found equally in both males and females. [13] Thus, there is need for appropriate referral when such defects are suspected. Color vision defect can also be classified based on the type of cone that is malfunctioning into deuteranomaly/deuteranopia (reduced or loss of green cone sensitivity), protanomaly/protanopia (reduced or loss of red cone sensitivity) or tritanomaly/tritanopia (reduced or loss of blue cone sensitivity). [14]

In a study by Cole et al. [15] it was also reported that color blind individuals had a slower response time and higher error rates than normal individuals when using video terminals or computer display units. Protanopes were said to be particularly disadvantaged in responding to a "fail" message. Campbell et al. [16] in a study of doctors and their assessment of clinical photographs discovered that, doctors with CVD differed from controls in respect of their ability to detect, and in their confidence in the assessment of abnormalities presented in clinical photographs.

Hence, this study aims to test for color vision at the secondary school level before a definitive career choice is made.

Material & Method:

The study is a community- based descriptive cross-sectional study involving public secondary school students from randomly selected schools in Bihar. The participants who met the inclusion criteria were selected using a multistage random sampling technique. The participants had a comprehensive ophthalmological eye examination and Ishihara color vision testing was carried out in a room with sufficient indirect daylight illumination or outdoors using the 24 plate 2009 edition.

Subjects who were able to identify 13 or more plates were adjudged to have normal color vision while those that identified only nine plates or less were judged to have failed the screening test. Such subjects were then shown diagnostic plates 16 and 17 to determine if color vision defect was protan or debuts. The prevalence of CVD was determined by the number of students who failed the Ishihara test. These same subjects who failed the Ishihara test were then administered the Farnsworth Munsell D15 test to further classify and grade the pattern and severity of color blindness. At the end of the tests a structured questionnaire was administered to ascertain their future career choices.

All data generated were entered into a personal computer and then analyzed with the help of a statistician using commercially available Statistical Package for Social Sciences Package version 21 (SPSS-21). Mean and standard deviations were determined for age.

Results:

A total of 900 secondary school were included in the study, out of which, 401 males (44.5%) and 499 (55.4%) females with a male female ratio of 1:1.3. Mean age of students was 14.5 years. The prevalence of color vision disorders was 2.85 % (p-value 0.001). 75.5% of those with CVD reported a positive family history of CVD (p-value 0.0220). [Table 1]

Table 2 showed the desired future occupation of the study subjects. Majority of the students desired to be health workers (n=379; 42.1%), followed by engineer (n=233; 25.89). Others include mass communication, law, sportsmen, and teachers etc. [Table 2]

Health workers include doctors, nurses, and medical laboratory scientists (Table 3 & 4). Table 4 shows Three-quarters of students with positive family history of color vision disorder were color blind 25 (56.83%) and this proportion was also statistically significant (X2 = 5.02, DF=1 p-value = 0.01)

Table 1: Demographics of study population.

Total number	No. males	No. females	M: F	Mean age	Prevalence of CVD
900	401 (44.5%)	49955.4%)	1:1.3	14.5 years	2.85 %

Table 2: Future occupation desired by the Study Subjects.

Sr. No.	Future occupation	Number of students	Percentage
1	Health workers	379	42.11
2	Engineer	233	25.89
3	Banking/ Accountant	143	15.9
4	Law	68	7.55
5	Teaching	47	5.22
6	Military/Paramilitary	18	2.0
7	Others	12	1.33
8	Total	900	100

Table 3: Family history of Color Vision Disorder.

Variable	No of Students	Percentage%
Yes	46	5.11
No	68	7.55
Not sure	177	19.67

Table 4: Color vision disorder in students with positive family history.

Variable	Positive	n%	Negative	n%
Gender				
Male	30	68.18	364	42.52
Female	14	31.82	492	57.48
Total	44	4.88	856	95.11
Family history present	25	56.82	10	1.168
Family history absent	19	43.18	846	98.83
Total	44	4.88	856	95.11

Discussion:

The importance of good colour vision cannot be over-emphasized. It is required in color-related school tasks, daily activities and some occupations. However, it is often overlooked in visual function assessment. The prevalence of color vision defect found in this study was 1.2% (95% CI = 0.51–1.89). There is no national figure for the prevalence of color vision defect in India as it was not captured in the Indian National Blindness and Visual impairment Survey. The prevalence varies in the different geopolitical zones of the country. This low prevalence of color vision defect found in this study is comparable to the prevalence reported in previous studies from other geopolitical zones in India (1.2-2.6%). [14-15]

The proportion of individuals with CVD barred from jobs in specific fields, such as army and police, reported in this study are similar to the numbers previously reported. However, the numbers reported here are a conservative estimate, as there is a lack of detailed history in some individuals and also due to the absence of a specific query regarding occupation in history-taking. Moreover, dichromats and protans are more frequently disallowed from a particular job such as police and army compared to individuals with anomalous trichromacy and deutans, respectively. [16]

Over 70% (n=17; 73.9%) of the students with CVD in this study had a positive family history of color vision disorder and this association was statistically significant (p-value 0.022). The CVD was of the congenital variety. A similar trend was noticed by Dahlan et al. [17] where he reported a higher prevalence of CVD (35.5%) amongst those with a positive family history in comparison to those without a positive history (20.5%). The higher values noted in this study may not have been unrelated to the poor understanding of the leading question by the respondents. This differed from a study carried out by Dargahi et al. [18] who noted in his study that all the color-blind individuals had a positive family history of the defect, although the correlation was not statistically significant.

A study done in Britain in contrast found that children with color vision defect scored higher in mathematics and reading than those with normal color vision and this was statistically significant suggesting that color defective children may do well as their peers educationally. A higher proportion of participants with color vision defect had difficulty with fine art. This is similar to the finding in Brazil where color defectives had problems with coloring during artistic education classes. [19]

The number of people with CVD who sought an X-chrome contact lens trial was very low. There are no previous studies to compare this result. Various reasons that could be attributed are as follows: Unlike refractive correction spectacles, any colored filters (such as X-chrome) are not allowed while taking up occupational color vision tests, which might have discouraged the individuals to try it. Besides, the potential beneficial effect in improving the color perception is limited, in addition to the apparent interocular differences in contrast resulting in undesirable effects, such as rivalry between the eyes and loss in depth perception. [20-23]

Conclusion:

The majority of color-blind students expressed a preference for jobs that require color vision. To guarantee effective vocational counselling and choice, measures should be put in place to establish school eye screening programmes to educate and ensure that kids are checked for CVD at least once throughout secondary schooling.

Full exemptions for individuals with CVD cannot be provided; however, identifying the type and severity of the defect in occupational settings would provide relief for at least some individuals with a mild-to-moderate level of CVD. The implications of this new knowledge with regard to CVD and occupational setbacks would be the first step toward voicing advocacy changes in the recruitment process in various professions based on the type, severity of color vision loss, and critical color-related task in the work environment.

References:

1. Fareed M, Anwar MA, Afzal M. Prevalence and gene frequency of color vision impairments among children of six populations from North Indian region. Genes Dis 2015;2: 211-8.
2. Shah A, Hussain R, Fareed M, Afzal M. Prevalence of Red-Green color vision defects among Muslim males and females of Manipur, India. Iran J Public Health 2013;42:16-24.
3. Gupta N, Arya SK, Walia D, Mallik A, Sood S. Ocular morbidity among school-going children in the Union Territory of Chandigarh. Int Ophthalmol 2014;34:251-7.
4. Sarkar A, Medhi G, Bhattacharyya H, Pala S, Gogoi S. Pattern of ocular morbidities: A cross-sectional study on school-going children in Shillong city. J Fam Med Prim Care 2019;8:2124-8.
5. Naresh S. Study of color blindness in Jat Sikhs. Indian J Physiol Pharmacol 1995;39: 127-30.
6. Mahajan OP, Gogna RS. Study of color blindness in school children. Indian J Physiol Pharmacol 1977;21:59-62.
7. Kundu BK, Chakma B. Prevalence of color vision defect in the indian population-results from a pre-employment screening centre of a tertiary care hospital. J Contemp Med Res 2020;7:I19-23.

8. Pandey N, Chandrakar AK, Garg ML. Tests for color vision deficiency: Is it time to revise the standards? Indian J Ophthalmol 2015;63: 752-3.
9. Barry JA, Mollan S, Burdon MA, Jenkins M, Denniston AK. Development and validation of a questionnaire assessing the quality of life impact of Colour Blindness (CBQoL). BMC Ophthalmol 2017;17:1-7.
10. Stoianov M, de Oliveira MS, dos Santos Ribeiro Silva MCL, Ferreira MH, de Oliveira Marques I, Gualtieri M, et al. The impacts of abnormal color vision on people's life: An integrative review. Qual Life Res 2019;28:85 5-62.
11. Steward JM, Cole BL. What do color vision defectives say about everyday tasks? Optom Vis Sci 1989;66:288-95.
12. Long JA, Honson V, Katalinic P, Dain SJ, Cole BL. Re: Is screening for congenital color vision deficiency in school students worthwhile? A review. Clin Exp Optom 2015; 98:192.
13. Bailey J, Fraunfelder F, Neitz J, et al. Color Vision Deficiency - A concise tutorial for Optometry and Ophthalmology. Richmond Products. Albuquerque, New Mexico; 2010.
14. Cole BL, Macdonald WA (1988) Defective color vision can impede information acquisition from redundantly color-coded video displays. Ophthalmic Physiol Opt 8(2): 198-210.
15. Campbell JL, Spalding AJ, Mir FA, Birch J (1999) Doctors and the assessment of clinical photographs--does color blindness matter? Br J Gen Pract 49(443): 459-461.
16. Steward JM, Cole BL. What do color vision defectives say about everyday tasks? Optom Vis Sci 1989;66:288-95.
17. Dahlan H, Mostafa O. Screening for Color Vision Defects among Male Saudi Secondary School Children in Jizan City, Kingdom of Saudi Arabia. Med JCairo Univ 2013;81: 513-17.
18. Dargahi H, Einollahi N, Dashti N. Color blindness defect and medical laboratory technologists: unnoticed problems and the care for screening. Acta Med Iran. 2010;48(3): 172-77.
19. Melo DG, Galon JEV, Fontanella BJB. Colorblind individuals and their difficulties: a neglected condition in Brazil? Physis. 2014; 24(4):1-12.
20. Swarbrick HA, Nguyen P, Nguyen T, Pham P. The ChromaGen contact lens system: Colour vision test results and subjective responses. Ophthalmic Physiol Opt 2001;21:182-96.
21. Hovis JK. Long wavelength pass filters designed for the management of color vision deficiencies. Optom Vis Sci 1997;74:222-30.
22. Siegel IM. The X-chrom lens. On seeing red. Surv Ophthalmol 1981;25:312-24.
23. Matsumoto ER, Johnson CA, Post RB. Effect of x-chrom lens wear on chromatic discrimination and stereopsis in color- deficient observers. Optom Vis Sci 1983;60: 297-302.