Journal of Chitwan Medical College 2020;10(34):87-89
Available online at: www.jcmc.com.np

ORIGINAL RESEARCH ARTICLE

COLOUR VISION DEFICIENCY AMONG MEDICAL STUDENTS OF CHITWAN

Pujan Bhusal[1,*], Sameer Timilsina[1], Ram Lochan Yadav[1], Niraj Khatri Sapkota[1], Md Nazrul Islam[2]

[1]Department of Physiology, Chitwan Medical College, Chitwan, Nepal
[2]College of Pharmacy, University of Hafr Al Batin, Kingdom of Saudi Arabia

Received: 6 Oct, 2020

Accepted: 5 Dec, 2020

Published: 16 Dec, 2020

Key words: Colour vision deficiency; Ishihara chart; Medical students.

***Correspondence to:** Pujan Bhusal, Department of physiology, Chitwan Medical College, Chitwan, Nepal. Email: bhusal.pujan@cmc.edu.np*

Citation

Bhusal P, Timilsina S, Yadav RL, Sapkota NK, Islam MN. Colour vision deficiency among medical students of Chitwan . Journal of Chitwan Medical College.2020;10(34):87-89.

ABSTRACT

Background: Colour vision is the function of three types of cone pigments present in the retina. Though colours are used for important signs in the medical profession, screening for colour blindness is not paid attention at beginning of a medical career. This study was aimed to assess the presence of colour blindness, if any among the medical students of Chitwan Medical College.

Methods: A total of 220 medical students including 127 females and 93 males aged between 16-24 years were examined for colour blindness. Students were shown the complete range of Ishihara's plates under daylight conditions. The chart was held 75 cm away from the subjects. The types of colour vision deficiency were differentiated with help of key provided with the chart. The data was analyzed by using Statistical Package for the Social Sciences version 20.

Results: Among 220 participants, 5(2.27%) were found to have colour vision deficiency. Out of 5colourdeficient students, 4of them were red-green colour vision deficient and 1 of them couldn't appreciate colour (total colour blindness) within the speculated time for the test. Female participants didn't have colour vision deficiency while colour vision deficient students were unaware of their colour vision status.

Conclusions: Colour vision deficiency affects male than female. Medical students should be screened for colour vision deficiency and made aware of their limitation so that they can take special care in their future clinical practice.

INTRODUCTION

Human retina contains photoreceptors; Rods and Cones, which are responsible for night/dark vision and colour vision respectively. Human colour vision is the amalgamation of red, green, and blue lights.[1] Colors are perceived by cones and signals are generated which are mixed by the brain and create wide spectrum of colour that we perceive.[2] Color vision deficiency(CVD), is the inability or decreased ability to perceive color differences under normal lighting. Most of the CVD are congenital but seldom it may be acquired as well.[3] The four types of CVD are Protan (red), Duetan (green), Tritan (blue), and Achromatopsia (total absence of colour vision).[4]

Colour is often used as an important sign in medical practice as many descriptive and diagnostic terms like jaundice, cyanosis, pallor, erythema, are used. It is also used while doing colour coding for many new technologies and procedure.[5] Therefore, medical students must be aware of their limitation and become more alert during their clinical practices.

Several studies are done throughout the world to determine colour blindness in medical students but limited studies are done in Nepal. Therefore, this study was aimed to assess the color vision deficiency in medical students.

METHODS

This cross-sectional study was conducted among 220 students between 16 to 24 years, at the Department of Physiology of Chitwan Medical College, Bharatpur, Chitwan. The experiment on determination of colour blind is conducted as a part of routine practical every year in the first year of medical (MBBS, BDS and Nursing) students. Total consecutive sampling technique was used for selection of sample. Informed consent was obtained from the students. The study was carried out on all the first-year students (MBBS, BDS and Nursing) attending physiology practical classes from January 2020 to March 2020 after obtaining ethical approval from IRC-CMC (Ref: 076/077-032). Students were also questioned for any ocular diseases like cataract or any retinal disorder; history of intraocular surgery or history of chronic medication. None of the students had such history. Before the test, each student was given proper instruction. Students with reduced visual acuity were tested for colour vision with aided eye.The Data was collected was entered in Statistical Package for the Social Sciences (SPSS) version 20.

The ishihara chart is Pseudo-Isochromatic (Ishihara's test for Colour Deficiency: 24 plate edition)consisted of printed figures which are intentionally made of colours that are liable to look the same as the background to an individual who is colour deficient.[6] The chart was held 75 cm away from the subjects. Time allocated to identify the number on the test plates was 5 seconds. The types of colour vision deficiency were noted and differentiated by principal author with the help of key provided with the chart. The students were asked to read the numbers seen in test plates 1 to 17. Recognition of plates 1to 15 determines the normality or defectiveness of colour vision. If 13 or more plates were read correctly, the colour vision was considered as normal. If only 9 plates or fewer plates were read correctly, the colour vision was regarded as a red-green deficient. The plates 16 and 17 are used to differentiate protan and deutan types of colour vision efficiency. The Ishihara test is quick and easy and is an excellent screening tool to detect those with red-green CVD. Still, it has a limited ability to classify CVD and determine its severity.[7] Other methods such Naegel anamaloscope test and Franseworth-Munsell 100 hue test are also available to test for colour vision which are more sensitive and accurate.

RESULTS

This study was carried out in 220 medical students. The gender distribution of the study subject is shown in Figure 1.

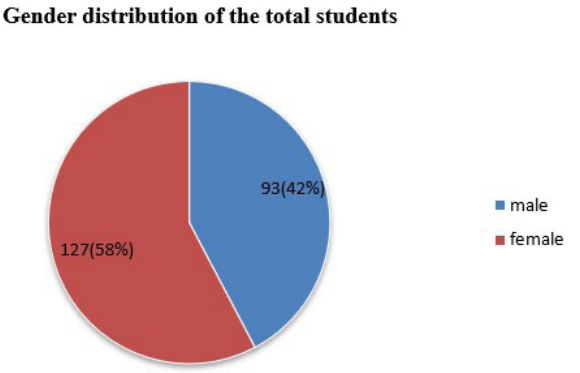

Figure 1: Gender distribution of the total students

Study was undertaken in age group of 16-24 years. In present study, 5 among total students had color vision deficiency accounting for 2.27%of the total students have CVD. All of them were male. Therefore5.37% of the total male participant had CVD (Table 1).

Table 1: Gender distribution of colour vision deficiency (N=220)

Subjects	Number of CVD
Male (93)	5 (5.37%)
Female (127)	0 (0.00%)
Total (220)	5 (2.27%)

Among 5 students, four were suffering from Deuteranomaly and 1 student had total CVD (Table 2).

Table 2:Types of colour vision deficiency

Subjects	Deuteranomaly	Total CVD
Male	4	1
Female	0	0

DISCUSSION

In The type of CVD depends on whether it is congenital or acquired. Congenital CVD is hereditary recessive X-linked disorder which is more prevalent in men than women.[8] Most of the time CVD remains unnoticed.[9] In western countries 8% of men and 0.4% of women have colour vision deficient .[10]In Malaysia, 8.4%males and 0.3%female have CVD in medical and paramedical profession[11], in china the prevalence of CVD is 4-6.5% [12] ,in Nepal 5.8 % medical students were colour deficit.[9]

In the present study among 220 medical students 2.27 % (n=5)of the students had CVD and all of them were male. Similar study by Sandhya R reported the prevalence of colour blindness in medical students was3% with a frequency of colour blindness higher in male than female .[6]

Another study from Nepal had 12 (5.5%) colour blind students. Among them 1 was totally colour blind, protanomaly was detected in 1, deutranomaly was detected in 3 and deutranopia in 7 volunteers.[13] Other studies[1, 3, 14] also reported the higher frequency of CVD in male in compared to female. Higher frequency in male indicate it is genetically determined by X-linked recessive inheritance and thus occurs in males but is transmitted via females and about 8% of all women are carriers.[3]

None of the girls in our study had CVD which makes our study similar with studies in India[15], Nepal.[16] In contrast to our study, many studies have reported presence of colour deficiency among female student.[4, 8, 11, 17] This could be due to the common practices of consanguineous marriage in that part of the world. However, other reason may be that our studies reported only congenital CVD and where as other reported acquired and congenital CVD which could lead to different results.

Red-Green defects (Protan and Deutan) show the highest prevalence in the general population. The cause of Protan and Deutan defects is by recessive mutations of the genes located on the long arm of the X-chromosome within Xq 28 band.[2] Present study has highest number of Deuteranomaly students which is analogous with other studies.[3,6,16,17] The studies have found that the frequency of red/green color blindness varies between different races, tribes and ethnic groups.[16] The finding of our study is different from the finding by Hashemi H et al[8] where tritanopia was the most common type of CVD .The difference in the result may be be tool they used for the assessment of vision. Farnsworth D-15 test which can detect CVDs, especially blue-yellow deficiency whereas we used Ishihara's test which can only detect red-green deficiency and cannot detect blue-yellow deficiency, some CVDs may be missed in studies that use the Ishihara's test.[18]

Our study does have some limitations. We included a small

number of population and enrolled only one institute hence we cannot generalize the result. We used Ishihara test for determining CVD which is quick and easy but it has limited ability to classify CVD and determine its severity. The recommended method to grade and classify CVD is to use Farnsworth Panel D15 or Farnsworth–Munsell 100-hue tests.[7] However, this is not available to us.

CONCLUSION

Our study demonstrated the presence CVD more common in males than in females. Moreover, the students were unaware about their condition. Students with colour blindness should be counseled for their further specialization. The color blindness frequency in the public requires multilateral and extensive studies. Population-based studies can meet this need and offer health policy makers with a better perspective of this condition.

ACKNOWLEDGEMENT

We would like to thank CMC-IRC and Principal, CMC for allowing us to conduct the project at the institute. Our heartiest thanks all students who participated in this study to make this study into reality.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

REFERENCES:

1. Patel JR, Trivedi H, Patel A, Patil S, Jethva J. Assessment of colour vision deficiency in medical students. Int J Community Med Public Health. 2016;3(1):230-5. [DOI]
2. Panat A, Kulkarni D. Prevalence of red-green color vision deficiency (cvd) among science students: a. 10 years' survey. Human Biology Review. 2016; 5(1): 65-71. [LINK]
3. Mitiku RG, Tolera BS, Tolesa ZG. Prevalence and allele frequency of Congenital Colour Vision Deficiency (CCVD) among students at Hawassa University, Ethiopia. Journal of the Egyptian Public Health Association. 2020;95(1). [DOI]
4. Mughal IA, Ali L, Aziz N, Mehmood K, Afzal N. Colour vision deficiency (CVD) in medical students. Pakistan Journal of Physiology.2013;9(1):14-6. [LINK]
5. Spalding JA. Colour vision deficiency in the medical profession. Br J Gen Pract. 1999;49(443):469-75. [DOI]
6. Sandhya R, Remy J H. Colour vision abnormalities among medical students. Indian Journal of Clinical and Experimental Ophthalmology. 2017;3(3): 315-8. [LINK]
7. Pandey N, Chandrakar AK, Garg ML. Tests for color vision deficiency: Is it time to revise the standards? Indian Journal of Ophthalmology. 2015;63(9):752. [DOI]
8. Hashemi H, Khabazkhoob M, Pakzad R, Yekta A, Heravian J, Nabovati P, et al. The prevalence of color vision deficiency in the northeast of Iran. Journal of current ophthalmology. 2019;31(1):80-5. [DOI]
9. Pramanik T, Sherpa M, Shrestha R. Color vison deficiency among medical students: an unnoticed problem. Nepal Med Coll J. 2010;12(2):81-3. [PMID]
10. Dargahi H, Einollahi N, Dashti N. Color Blindness Defect and Medical Laboratory Technologists Unnoticed problem and the care for screening. Acta Med Iran. 2010;48(3):(3):172-7. [PMID]
11. Balasundaram R RS. Prevalence Of Colour Vision Deficiency Among Medical Students And Health Personnel. Malays Fam Physician. 2006;1(2-3):52-3. [PMID]
12. Chan E, Mao WS. Colour-blindness among the Chinese. Br J Ophthalmol. 1950;34(12):744. [DOI]
13. Pramanik T, Khatiwada B, Pandit R. Color vision deficiency among a group of students of health sciences. Nepal Med Coll J. 2012;14(4):334-6. [PMID]
14. Khairoalsindi OA, Almasoudi BM, Bamahfouz AY, Alghamdi AA, Siddiqui MI. Prevalence and Determinants of Color Vision Defects among Preparatory University Students at Makkah, Saudi Arabia. Middle East Afr J Ophthalmol. 2019;26(3):133-7. [DOI]
15. Kar SS, Agrawala M. A Study on Colour Vision Deficiency among Medical Students of Odisha. Journal of Evidence Based Medicine and Healthcare. 2018;5(9):806-8. [DOI]
16. Jha RK, Khadka S, Gautam Y, Bade M, Jha MK, Nepal O. Prevalence of Color Blindness in Undergraduates of Kathmandu. J Nepal Med Assoc. 2018;56(214):900-3. [DOI]
17. Karim KJ, Saleem MA. Prevalence of congenital red-green color vision defects among various ethnic groups of students in Erbil City. Jordan Journal of Biological Sciences. 2013;147(898):1-4. [LINK]
18. Dain S. Clinical colour vision tests. Clin Exp Optom 2004; 87(4-5):276-93. [DOI]