International Journal of Medical Science and Clinical Inventions 4(8): 3137-3139, 2017
DOI:10.18535/ijmsci/v4i8.01 **ICV 2015: 52.82**
e-ISSN:2348-991X, p-ISSN: 2454-9576

Research Article

Prevalence of Congenital Colour Vision Deficiency (CVD) in School Children of Bhaktapur, Nepal

Kharel Sushil[1], Mainalee Mandira [2], Raut Binod [3], Dhungana Arun [4], Gupta Rani [5]

[1]Department of Physiology
[2]Community Social Worker
[3]Department of Pharmacology
[4]Department of Biochemistry
[5]Professor and HoD
Department of Physiology, Kathmandu Medical College and Teaching Hospital, Kathmandu, Nepal

Corresponding Author: Sushil Kharel

Abstract:

Background: The incidence of congenital colour vision deficiency shows different trends and may vary in different geographical areas. Colour plays vital role in daily life functioning but there is no effective screening for Colour Vision Deficiency (CVD) at any school level. The school children with CVD may feel difficulty in identifying colour figures, lab instruments and specimens which may lead to failure in the examination. Not only this they may find difficulty in daily life functioning so, this study is aimed to find out the incidence of CVD in school children.

Methods: A total of 585 school children including 312 males and 273 females between ages 10-16 years were examined for congenital CVD in different schools of Bhaktapur. Each school child was shown the complete range of Ishihara's plates under day light conditions at distance of 75 cm and each plate was shown to them for duration of 5 seconds.

Results: Children's colour vision was tested using Ishihara's 38 Plates edition. Among 312 boys, 16(5.12%) were colour deficient. Among 273 girls, 7(2.56%) were colour deficient.

Conclusion: With this incidence of colour vision deficiency it shows the importance of screening for CVD in school children and counseling them for daily life functioning and making aware about the choice of career in future.

Key Words: Ishihara's Charts (Plates), Colour vision deficiency, Bhaktapur.

INTRODUCTION

Color blindness is an ailment characterized by the inability to clearly distinguish various colors of spectrum. Human color vision is generally trichromatic i.e. the mixture of red, blue and green lights.[1] Almost all color vision deficient are congenital. Red-Green defects show the highest incidence in the population.[2]Colour vision plays vital role in health care system and have three attributes: hue, intensity and saturation.[3] The people who are colour blind are not actually blind, but are colour deficient, so right term to be used for colour blindness is colour vision deficiency (CVD).It is also called 'Daltonism', after the name John Dalton.[4] CVD is a abnormality of colour perception that occur if the amount of visual pigment per cone is reduced, or if one or more of the three cone systems are absent. People with CVD are often unable to distinguish between various colours of the spectrum.[5] Deficient in color vision, in the case of red-green color blindness, is genetically determined by X- linked recessive inheritance.[6] Being a genetic disorder, the prevalence, of color blindness, differs from race to race and is different around the world.[7] The perception of colours depend upon the ability of receptors in retina. Rods are principlally responsible for black and white vision whereas cones are actually responsible for colour vision. The Young Helmholtz theory of colour vision in human, states the presence of three kinds of cones, each having a different photo pigment and mainly sensitive to one of the three primary colours[7-8].Color blindness is one of the most studied genetic markers. It has been postulated that natural selection operates in higher intensity CVD among many populations.[9-10]Generally colour blind children may remain undiscovered and remain unaware about the problem. It may cause difficulties in the process of learning which may cause decrease interests and lesser efficiency in the student's performances. Early findings of colour vision deficiency and its associated problems in children, allow parents and children to cope with the problems smoothly by making proper adjustments.

METHODS

A cross sectional study was conducted in school children of Bhaktapur after obtaining ethical clearance from Institutional

Review Committee (IRC) of Kathmandu Medical College. Informed written consent was taken before collecting the data. The study was done in May-June, 2017. A total of 585 school children aged 10–16 years (Both males and females) were tested for CVD. The selection of students was done by purposive sampling method. i.e the children willing to be tested were only enrolled in the study. Each student was shown the complete range of Ishihara's plates under natural day light at a distance of 75 cm.Time taken for reading each plate by the subject was not be more than 5 seconds. The types of color vision deficiency was differentiated with the help of key provided with the chart. The tests was performed as recommended by Ishihara[11-14].

RESULTS

In the present study 585 school children (Boys 312, girls 273, age 10-16 years), from four schools of Bhaktapur , Nepal was assessed for congenital color vision deficiency. The prevalence of color blindness among the study subjects showed higher prevalence in male subjects. Among 312 boys, 16(5.12%) were colour deficient(Figure 2). Among 273 girls, 7(2.56%) were colour deficient .Among the color deficients, were deuteranopia (06), deuteranomaly (11) and protanomaly (06)(Table 1and Figure 1).

Table 1: Prevalence of congenital colour vision deficiency among the study subjects. (N=585)

Subjects	Normal colour vision	Colour deficient	Deuteranopia	Deuteranomaly	Protanomaly
Boys(312)	296	16	05	09	02
Girls(273)	266	07	01	02	04
Total(585)	562	23	06	11	06

Figure1: Percentage distribution of different types of color vision deficiency (CVD) among the study population.

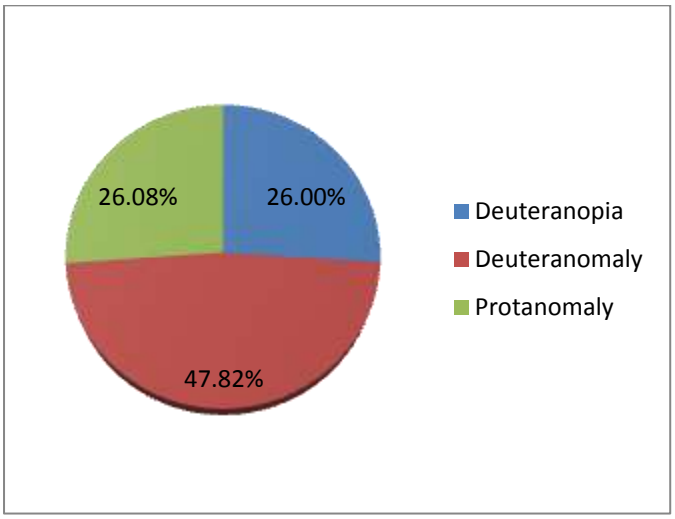
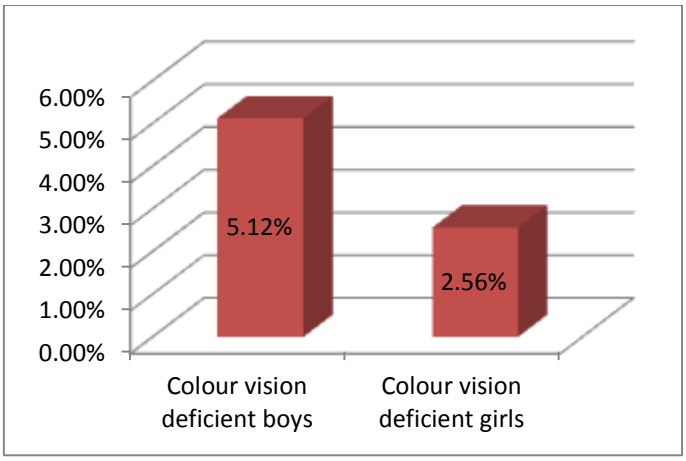


Figure2: Sex-wise percentage distribution of color vision deficiency (CVD) among the study population (N=585).



DISCUSSION

The percentage distributions of color vision deficiency in the different ethnic groups and countries are found to be variable: in our present study the prevalence of color vision deficiency among the male children (5.12%) were found to be similar recorded by Niroula and Saha (3.8%) in Pokhara, Nepal[15]. In the present study the prevalence of color vision deficiency among female children (2.56%) were found to be similar with some researches done in Saudi Arabia (0.75%) by Oriowo and Alotaibi in 2008[16]. Similarly in India it was seen in 1.69% in a study done by Shah *et al*. in 2013[17].It is also found that the prevalence of colour vision deficiency in boys is 5.12% by this study which is slightly less than 8% prevalence rate observed in males among Caucasians in Europe, Great Britain and United States[18]. Thus though the prevalence rate for colour vision deficiency is quite similar all over the world but a smaller difference in the incidence rate is observed which may be attributed to the ethnic variations in the different populations and geographic regions. From this study it is also observed that prevalence of colour vision deficiency is much higher in males (i.e. 5.12%) as compared to that in females (i.e. 2.56%).

CONCLUSION

Colour vision deficiency sometimes cause issues such as difficulty at school if colours are used to help with learning, problems with food, identifying whether the fruit is ripe or not, trouble in identifying safety warnings or signs. Certain jobs, such as pilots,pathologists, train drivers, electricians and air traffic controllers, may require accurate colour identification. A proper study should be done in order to find the prevalence of CVD in school children so that in future, such people could avoid certain career and make their life comfortable.

ACKNOWLEDGEMENTS

I express my deep sense of gratitude to my participants without their cooperation this study might not have been successful.

REFERENCES

1. Curcio CA, Sloan KR, Kalina RE and Hendrickson AE. 1990. Human photoreceptor topography, *J Comp Neurol*. 292: 497-523.

2. Citrik M, Acaroglu G, Batman C and Zilelioglu O. 2005. Congenital color blindness in young Turkish men. *Ophthalmic Epidemiol*. **12**: 133-7.
3. Barrett KE, Barman SM, Boitano S, Brooks HL. Vision. In: Ganong's Review of Medical Physiology. 23rd ed. New Dehli: Tata McGraw Hill Education Private limited; 2010. p.195–7.
4. Dalton J. Extraordinary facts relating to the vision of colors: with observations. Memoirs of the Literary and Philosophical Society of Manchester 1798;5:28–45.
5. Colors for color blind. (Clinical information) 2011; Available at: http://www.teledo bend.com/color blind/cbinfo.asp.
6. Guyton AC, Hall JE. Textbook of Medical Physiology. 11th edition. Elsevier Publication. 2005; 633.
7. Rahman SA, Singh PN, Nanda PK. Comparison of the incidence of color Blindness between sections of Libyan and Indian Populations. *Indian J Phsiol Pharmacol* 1998; 42: 271-5.
8. Ganong W. F. Review of Medical Physiology. Twentieth edition. Lange Medical Books? McGraw- Hill Medical Publishing Division. Pp. 160.
9. Pickford RW. 1963. Natural selection and colour blindness. *Eugen. Rev*., **55**: 97-101.
10. Tortora GJ and. Grabowski SR. 1996. Principles of Anatomy and Physiology. Harper Collins. New York.
11. Balasundaram R, Reddy S C. Prevalence of colour vision deficiency among medical students and health personnel. Malaysian Family Physician, 2006; 1(2&3): 52-3.
12. Agrawal S, Bansood N. Prevalence of Colour Blindness in School Children. International Journal of Science and Research, 2014; 3(4):175-7
13. Ishihara S. Tests for color-blindness (Handaya, Tokyo, Hongo Harukicho, 1917)
14. Natu M. Colour blindness- A rural prevalence survey. Indian J Ophthalmology, 1987; 35:71-3.
15. **.**Niraula D, Saha C G. The incidence of colour blindness among some school children of Pokhara, West Nepal. Nepal Med Coll J 2010;12(1):48–50.
16. Oriowo OM and Alotaibi AZ. 2008. Colour vision screeninig among Saudi Arabian children. *The South African Optometrist*, **67(2)**: 56-61.
17. Shah A, Hussain R, Fareed M and Afzal M. 2013. Prevalence of red-green color vision defects among muslim males and females of Manipur, India. *Iranian J Publ Health*, **42(1)**: 16-24.
18. Benjamin W.J. Borisch's Clinical Refraction, Second edition. 2006. Butterworth Heinemann an imprint of Elsevier Inc. pp. 289-297.