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The prevalence of colour blindness in middle school student of southern Bhopal

[1] Dr. Subhash C Gupta, [2] Dr. SP Saxena, [3] Dr. Shreya Gupta, [4] Dr. Rohan Saxena, [5] Dr. Shrikant Sharma

[1] Assistant Professor, Department of Ophthalmology, RKDF Medical College Hospital & Research Center, Bhopal, Madhya Pradesh, India

[2]Associate Professor, Department of Ophthalmology, RKDF Medical College Hospital & Research Center, Bhopal, Madhya Pradesh, India

[3]Senior Lecturer, Department of Oral Pathology & Microbiology, Bhabha College of Dental Sciences, Bhopal, Madhya Pradesh, India

[4] Consultant Periodontist, Madhya Pradesh, India

[5] Associate Professor, Department of Surgery, L.N. Medical College & Research Centre, Bhopal, Madhya Pradesh, India

Abstract

Background: Colour blindness-the inability to appreciate one or more primary colours is either anomalous or anopia. The present study was targeted at determining the prevalence of colour blindness in middle school student of southern Bhopal.

Methods: The present cross- sectional study was carried out in private schools of Bhopal. The total number of school children were 738 (401 boys and 337 girls) from 5th to 8th standard. Colour vision was tested by Pseudo- Isochromatic Ishihara plate (Ishihara's type test, chart 38 plate 1991 edition).

Results: The overall colour blindness was observed in 2.5% out of 738 students. Boys in the present study showed prevalence rate 4.2% and 0.59 of girls were observed.

Conclusion: It can be concluded from the result that the Boys are at higher risk for colour blindness than girls.

Keywords: colour blindness, protanopes, deuteranopes, middle school student, southern Bhopal

Introduction

The term "colour blindness" was discovered by David Brewster (1798), which was formerly known as daltonism [1]. Colour blindness-the inability to appreciate one or more primary colours is either anomalous or anopia [2]. Colour vision deficiency affects 1 in 12 boys and 1 in 200 girls [3]. Congenital colour blindness may be divided into dyschromatopsia and achromatopsia.

Dyschromatopsia is due to the deficiency of mechanism to perceive colour. It has been classified into anomalous trichromatism and dichromatism. Anomalous trichromatism is in form of defective colour vision. The terms Protanomalous (red), Deuteranomalous (green) and Tritanomalous (blue) pigment respectively [2].

Dichromatism, the ability to perceive one of three primary colour is absent. If red colour is absent it is called Protanopia. Complete defect for green colour is called Deuteranopia. In the same way, absence of blue colour is called Tritanopia[2]. CVD most commonly affects the males, because of recessive trait linked to the X chromosome [4].

The Ishihara colour test is most widely used as the screening test of red – green colour deficiency. In Indians the prevalence was 3.69% in males and 1.04% in females [5]. Among 8-10% of Caucasians, male population was found to affected by red – green colour blindness due to congenital protan and deutan defects [6].

A recent Muslim population based study from India reported a prevalence of 8.13% of male and 1.69% of females [7]. Amblyopic children have lowest prevalence of CVD [8]. There is no report of study undertaking the prevalence of colour blindness of southern Bhopal. High prevalence of red – green colour blindness has been reported in different races, tribes and ethnic groups [9].

Hence, the present study was targeted at determining the prevalence of colour blindness in middle school student of southern Bhopal.

Material and methods

The present cross- sectional study was carried out in private schools of Bhopal by Department of Ophthalmology RKDF Medical College and Research Center Bhopal. The total number of school children were 738 (401 boys and 337 girls) from 5th to 8th standard. Students between 11-14 years of age were included in the study.

We collected the data related to age, sex and grade, address of student from their parents or guardians. Before that we took approval and permission from respective school principal. Informed consent was taken from parents and guardians.

Colour vision was tested by Pseudo- Isochromatic Ishihara plate (Ishihara's type test, chart 38 plate 1991 edition). Examination was conducted in class room adequately lit by natural day light. Student was called according to the class (eg: 5th to 8th) to examination room. The colour vision testing plates were held at 75cm from student and tilted at right angle to the line of vision. Before the test, each student was given the instruction using the local language which was understandable by students.

Student was asked to read the number seen on the test plate and answer was noted down. The time limit allotted for telling number was less than 4 sec. Students who failed the screening

were asked to repeat the examination. The type of color blindness was differentiated with the help of key provided with the chart.

Inclusion criteria
1. Healthy students with normal ocular examination findings.
2. Students' age between 11-15 years.
3. Students willing to participate in the study.

Exclusion criteria
1. Head injury which significantly affects vision.
2. Chronic drug therapy (more than one month)
3. Eye diseases.

Ethical approval was granted by the Institutional Ethics Committee (IEC). All the data was entered and analyzed by using statistical packages for social science (SPSS) software version 20.

Results

The study was conducted in RKDF Medical College & Research centre in BHOPAL. Duration of this study was June 2016 to January 2017. A total number of students 738 were enrolled in this study.

Table 1: showing class wise and gender wise distribution of colour blindness

	5th class (n= 169)		6th class (n=196)		7th class (n=169)		8th class (n=204)	
	Boys	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**
Students examined	85	84	105	91	94	75	117	87
Colour blindness	4	0	7	1	2	0	3	1

The above table shows 17 boys and 02 girls having colour blindness out of 738 students.

Table 2: showing distribution of protanopia and deuteranopia

Colour blindness	Boys	Girls	Total percentage
Protanopes	11 (57%)	02(10%)	13 (68.4%)
Deuteranopes	6 (31%)	00	6 (31.5%)
Total	17	02	100%

In the present study the above table shows that protanomaly was observed in 13 students out of 19 colour blindness. Among 13 protanopes, 11 were boys and 02 were girls. Deuteranomaly was observed in 6 students out of 19 colour blindness. Among 6 deuteranopes, 6 were boys and no such cases observe in females.

Table 3: showing prevalence of colour blindness in total students

	Total number	Boys	Girls
Number of students examined	738	401	337
Number of colour blindness students	19	17	02
Prevalence of colour blindness	2.5%	4.2%	0.59%

In the present study, table: 3 shows that overall colour blindness was observed in 2.5% out of 738 students. Boys in the present study showed prevalence rate 4.2% and 0.59 of girls were observed.

Discussion

Colour blindness is a congenital disease. In the present study, colour vision screening tests only identify the red-green deficiencies. The study was conducted to determine prevalence rate of colour blindness in total of 738students (401 boys and 337 girls), in the age group between 11-14 years, from private schools of southern Bhopal, by using Ishihara's Type tests for colour blindness, 38 plate edition. The Ishihara's test showed good retest reliability [10].

Early detection of colour vision malfunction in children allows parents and teachers to make necessary adjustments to the teaching methods for appropriate learning. Saumya Agarwal *et al*. [11] revealed that total 12 students (2.02%) were color blind which includes 11 boys (3.16%) and 1 girl (0.40%). Out of 11 boys with color blindness, 10 boys (2.87%) showed deuteranomaly and 1 boy (0.29%) showed protanomaly whereas the girl showed deuteranomaly. In our present study, result shows that protanomaly was observed in 13 students out of 19 colour blindness. Among 13 protanopes, 11 were boys and 02 were girls. Deuteranomaly was observed in 6 students out of 19 colour blindness. Among 6 deuteranopes, 6 were boys and no such case was observed in females. Zein ZA in his study in North-west Ethiopia in 1988, using the Ishihara 24 plate edition reported a total of 40 colour blind (4.2%) among males and 2 (0.2%) among females [12]. In the present study the prevalence of colour blindness 2.5% was less than 3.2% of Rajasthan students among the age between 10-17 years [13] but greater than Uttranchal (2.17%), Nepal (1.80%), Himachal Pradesh (1.62%) [14].

Mulusew A *et al* reported prevalence of colour blindness among female Ethiopian population for the first time [15]. Moudgil T *et al*. [16] on his study among 55 protanopes, 51 were males and 4 were females. Deuteranomaly was observed in 6 students out of 61 color blind students. Among 6 deuteranopes, 4 were males and 2 were females.

Balasundaram R, *et al*. [17] to determine prevalence of color vision deficiency among medical students using 24 plate Ishihara's Test of color vision, found Red Green color vision deficiency in total 45 persons(3.2%) which includes 42 males(6.7%) and 3 females (0.4%). In our study boys shows prevalence rate 4.2% and girls were 0.59%.

The Incidence of Colour Blindness among some school children of Pokhara, Western Nepal, by Niroula and CG Saha [18] revealed that the boys 18 were colour blind with a prevalence of 3.8%. None of the girls were found to be colour blind. Among the colour blinds, 9, 6 and 3 boys were the victims of deuteranopia, deuteranomaly and protanomaly respectively. But in our present study we found that 02 (0.59%) girls have protanopes, similarly colour blindness was detected among girls, 0.40% in Pune [11], 1.69% in Manipur [7] of India.

Conclusion

In our study we concluded that colour blindness mostly affects boys. Red – green colour blindness is more common than other types. Boys are at higher risk for colour blindness than girls. We educated affected students, their parents and teacher on colour blindness. CVD children will try to hide their problem for fear of being mark out as different.

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