

Prevalence of colour blindness among school going children aged 10-17 years in Jodhpur city Rajasthan

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Abstract: Color blindness in which subject is unable to clearly distinguish different colors of the spectrum. Due to this decrease performance at school, reduce employability and productivity, and generally impair quality of life. This is school age based cross-sectional study to determine the prevalence of colour vision errors among school going children aged 10-17 years in government and private co-educational schools in Jodhpur city. In this study 1000 students of age 10-17 years were examined. Colour vision defects were screened with help of Ishihara's pseudoisochromatic test 38 plates. Prevalence of colour blindness was 3.2% which included 3.2% males and 0.00% females. Deutanopia was found more common than other types. All of subjects are not aware of their status of vision impairment. So this study is helpful to colour blindness students to know their disability and to adjust appropriately to overcome their difficulties. Early school screening for it is recommended.

Keywords: Colourblindness, Ishihara's chart, vision screening, school children, sex.

INTRODUCTION

Color blindness was discovered by scientist John Dalton (1798). This was classified according to Trichromatic Theory of Young Helm Holtz. Human color vision is normally trichromatic and required at least 3 cone photo pigments, one from each of three well separated spectral classes. The three classes of pigments differ in their relative spectral sensitivities, and are commonly referred to as the blue, green and red cone pigments. Color vision deficiency is one of the commonest disorders of vision and may be divided into congenital and acquired forms [1]. Red Green defects (Protan and Deutan) show the highest prevalence in the general population [2].

Impaired color vision, in the case of red-green color blindness, is genetically determined by Xlinked recessive inheritance and thus occurs in males but is transmitted via female and about 8.0% of all women are its carrier [3]. Because these defects are inherited as X-linked Traits, the incidences are much higher in Caucasian male (8.0%) than in females (0.4%) [4]. The prevalence of red-green color blindness has been found to vary between different races, tribes and ethnic groups [5]. A lot of professions require normal colour vision. A color blind person should be thoughtful against training for such employments as pilots, shoulders in army,

electrical jobs, navigators, police and aircraft workers [6]. Hence this study "Prevalence of colour blindness among school going children aged 10-17 years in Jodhpur city Rajasthan." was taken up.

MATERIAL & METHODS

This was a cross sectional and time bound study in which random cluster sampling among schools in Jodhpur city Rajasthan were taken. All children from the selected schools with the age ranging 10-17 years (class 5- 12) were included in the study. Informed consent from the parents of students was obtained with assistance of school head through their class teachers. The purpose of study was informed and explained to the children. Following students were not be included in this study who had eye injuries or eye diseases, e.g., corneal opacities, fundus pathology that affected visual functions and on chronic drug therapy (digoxin, barbiturates, anti-tubercular drugs and drug with side effect like sildenafil, ethambutol, chloroquine, indomethacin etc) for more than one month or with systemic illness or history of head injury with significantly affected vision.

The student was tested for colour vision deficiency with the help of Pseudo-Isochromatic Ishihara Plates, (Ishihara's Type Tests Chart 38 plate

edition 1991) for Color-blindness. The colour vision testing plates were placed at 75 cm from the student and tilted so that the plane of the paper is at right angle to the line of vision and set at eye level of subject. The test was done in adequate lighted room resembling natural day light. The time given for telling the number on a plate was less than 5 sec [7]. Student was asked to read the number seen on the test plate. Out of 38 plates, plate numbers 1 to 25 were used in the present study. The types of colorblindness were differentiated with the help of key provided with the chart. According to it, the first plate was presented first to check whether they followed instruction correctly or not. Students who made more than five typical red-green defective responses between plates 2 and 21 were decided to have failed the test [8, 9]. Thereafter, diagnostic plate numbers 22 to 25 were used to determine the precise type and severity of colour vision defects. Those who failed the test were immediately retested and result was noted down in Performa. List of students suffering from color vision impairment was given to the teachers which they would be asked to inform to respective parents regarding their problem and special care. In this study anomaloscope,

the gold standard in color vision test was not used to confirm the diagnosis, further classify the types and determine the severity of CVD. The instrument was not available in our set up. Of course the Ishihara test with 38 plate edition has been reported to have high sensitivity and specificity in identifying red-green color vision defects.

RESULTS

In this study total 1000 students were examined out of them 659 males and 341 females. The age of the students ranged from 10 to 17 year. Overall prevalence of color blindness was observed 3.2% out of 1000 subjects. Males in the present study showed the prevalence rate of 3.2%. No case of colour blindness in female was found because of inherited as an X linked recessive character [Table1]. The prevalence of Protanopia, Deutanopia, Tritanopia and Anopia in males was 0.8%, 2.4%, 0.00% and 0.00% respectively. Females were not found. It was observed that prevalence of Deutanopia was higher than other types [Table2].

Table-1: Gender wise distribution of color blindness [irrespective of type] in All subjects [n = 1000]

Sex	Number of color blind subjects	%
Male	32	3.2
Female	0	0
Total	32	3.2

Table -2: Gender wise distribution of different types of Color Blindness[n = 1000]

Sex	Protanopia	%	Deutanopia	%	Tritanopia	Anopia	Total
Male	8	0.8	24	2	0	0	32
Female	0	0	0	0	0	0	0
Total	8	0.8	24	2	0	0	32

DISCUSSION

Colour blindness is an important public health issue. At school age it has a dramatic impact on learning capability, educational and social potential. Poor vision in childhood affects performance in school or at work and has a negative influence on the long life of a child. Moreover, planning of the youth's career is very much dependent on color vision especially in jobs for the technician in labs, driver, police, navy, military, railways aviation, medical and paramedical staff etc.

Population based data related to prevalence of color vision errors among children are not readily available for India. For the available studies results are not comparable because of different methodologies/criteria used in those studies. In respect of color blindness, the percent distribution of color blindness is found to be variable in different countries. In present study, the overall prevalence of color blindness was observed 32 (3.2%) out of 1000 students in Jodhpur city of Rajasthan, India included in males

3.2% and in females 0.00%. It is similar to 3-4% prevalence rate in the Indian population [10].

In present study the prevalence of color blindness (3.2%) was less than 3.83% in Jat Sikh males in Punjab [11], 5.28% in Muslim of Manipur [12] and more than Agarwal S. *et al* [13] 2.02% in Pune, Arora KS *et al* [14] in different immigrant population in Punjab belongs to Bihar (2.79%), Uttarpradesh (2.74%), Utranchal (2.17%), Nepal (1.80%), Himachal Pradesh (1.62%), and Rajasthan (2.32%) .

Internationally in our findings the prevalence of color blindness among the boys were found to be similar to as recorded in Japan 3.6% [15], and China 3.7% [16] but less than the European whites 8.0% [17], Tehran 8.2% [18], Korea 5.9% [19], and Singapore 4.8% [20]. However, the prevalence of the color blindness (boys) in our present study is higher than Uganda 1.9% [21], Colombia 2.4% [22] and China 3.0% [23].

None of the girls in our study were found to be color blind due to inheritance as a X linked recessive character, which corroborates with the some researches done by Arora KS *et al* [14] in immigrant population in Punjab of India, Tibet [24], and Kenya [25] but in few studies color blindness was detected among girls, 0.40% in Pune [13], 1.69% in Manipur [12] of India, 0.4% in Tehran [18] and 0.4% in Korea [19].

This difference in the frequencies of color blindness in the two sexes can be explained on the basis of heredity of color vision deficiencies. These different studies indicate the prevalence of congenital color vision deficiency to be 2-6% in male population with very minimal of female being affected. Thus, there is less variation in the incidence of color-blindness in males in various regions and in various communities of India than that of the findings in other regions of the world.

To find out exact prevalence of colour blindness among the different ethnic groups, a further study in a large sample is necessary.

CONCLUSION

Colour blindness is more common congenital disorder in general population. Most of the children were unaware of their problem contributing to prevalence of colour blindness. Screening of school children for colour blindness can be simple and highly effective strategy in detecting these conditions. This must be followed by affordable corrective services and school health program.

The conclusions drawn from our study are as follows.

- Prevalence of color blindness falls within the range of 3-4% in India.
- Deuteranopia (red-green color blindness) is more common than others types.

Males are at higher risk for occurrence of color blindness. The male students suffer from the congenital colour vision error. Those with congenital colour vision deficiency should be properly counseled regarding problems in everyday works, their future jobs, genetic inheritance to their children, which would prepare them for the any future expostulations and confusions.

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