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Research Article

COMPARATIVE STUDY OF COLOUR BLINDNESS AMONG VARIOUS IMMIGRANT POPULATIONS IN PUNJAB

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ABSTRACT
2030 subjects were selected from various immigrant populations residing in different localities in Punjab, from the age groups of 10-70 years and of both sexes (1930 males and 100 females). Out of males, 48 were found to be suffering from colour blindness and none of the females were found to have colour blindness. The incidence in the present study in males was found to be 2.48% and in females it was 0.00%. The subjects were also tested for the visual acuity separately for each eye before testing them for colour vision. The colour vision was tested with the help of pseudo-isochromatic plates (Ishihara charts, 1968 edition: 38 plates). Out of 48 affected males, 9 were mild protons (0.44%), 7 were strong protans (0.34%), 20 were mild deutans (0.985%), 6 were strong deutans (0.295%), 1 was tritan (0.049%) and 5 could not be classified in any of sub-groups of red-green colour vision defects (0.246%).

Key Words: *Colour Blindness, Immigrant, Ishihara Charts, Tritan, Protons, Deutans*

INTRODUCTION
The incidence of colour deficiencies is relatively constant amongst Caucasians, about 8%. But other races show considerable variations. Only ~0.5% of women exhibit some form of abnormality in their colour vision. The vast majority of these deficiencies are expressed as differences in the perceptions of reds and greens, with ~1 in 15 men exhibiting a red/green colour deficiency. Colour blindness is most frequently inherited. Being a genetic disorder, the incidence of the colour blindness vary from race to race and is therefore, different in the different geographical regions of the world inhabited by people of different ethnicity.

Heredity of colour blindness was first established by Dalton (1798). Congenital colour vision deficiency (CVD) is present in a consequential percentage of men, but considerable variability exists in different populations (2-8%). Acquired CVD may escape detection, but if severe, is also associated with loss of visual acuity and/or visual field (Delpero *et al.*, 2005).

Various professions require normal colour vision. A colour blind person should therefore be advised against training for such occupations as pilots, certain jobs in armed forces, electrical jobs, navigators, police and aircraft maintenance workers (Guest *et al.,* 2011). Similarly people with abnormal colour vision are reported to have a significantly higher rate of road accidents (Verriest *et al.*, 1980).

This study was done to find out the incidence of congenital colour blindness in various immigrant populations residing in Punjab. No work has been undertaken so far in these populations in this region of the country. As the immigrant population is mainly found in Northern India. So, this part of the country has been selected for the present study.

MATERIALS AND METHODS
2030 subjects from various immigrant populations in Punjab, residing in different localities were selected from the age groups of 10-70 years. Out of these, 1930 were males and 100 were females.

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The cases were immigrant populations from Bihar, Uttarpradesh, Uttranchal, Himachal Pradesh (H.P.), Nepal and Rajasthan and were screened from Patiala, Sunam, Sangrur and Mansa regions of Punjab.
The subjects were also tested for the visual acuity separately for each eye before testing them for colour vision. Snellen's test chart for distant vision and Jaeger's chart for near vision were used. In all the affected subjects, both the eyes were defective for colour vision, on testing each eye separately.
The colour vision was tested with the help of pseudo-isochromatic plates (Ishihara, 1968 edition: 38 plates). The subjects were able to read the numerals. So, out of 38 plates, plate numbers 1 to 25 were used in the present study. Plate numbers 1 to 21 were used to determine if any red-green colour vision defects existed in a given subject, thereafter, plate numbers 22 to 25 were used to determine the precise type of colour vision defects.
The Statistical Analysis was done by X^2 test.

RESULTS

Table 1 shows incidence of colour blindness in 2030 subjects from different immigrant populations in Punjab and the results of colour blindness amongst them was compared. Maximum incidence of colour blindness was found in Bihar (2.79%) and minimum in H.P. (1.62%).

Table 1: Incidence of colour blindness amongst different immigrant populations in Punjab

Type of immigrant population	Total	Not Affected	Colour Blind	
			Number	% age
Bihar	680	661	19	2.79 %
Uttarpradesh	402	391	11	2.74 %
Uttranchal	276	270	6	2.17 %
Nepal	278	273	5	1.80 %
H.P.	308	303	5	1.62 %
Rajsthan	86	84	2	2.32 %
Total	2030	1982	48	2.36 %

$X^2 = 1.95$, p value >0.05

Table 2: Incidence of colour blindness according to sex amongst different immigrant populations in Punjab

Sex	Total	Not Affected	Colour Blind	
			Number	% age
Male	1930	1882	48	2.48%
Female	100	100	Nil	0.0 %
Total	2030	1982	48	2.36 %

$X^2 = 1.58$, p value > 0.05

From table 2 it was observed that out of 1930 males, 48 were found to be suffering from colour blindness and out of 100 females none was found to have colour blindness. The incidence in the present study in males was found to be 2.48% and in females 0.00%.
Table 3 shows the incidence of different types of colour blindness. Out of 48 affected males, 9 were mild protons (0.44%), 7 were strong protans (0.34%), 20 were mild deutans (0.985%), 6 were strong deutans (0.295%), 1 was tritan (0.049%) and 5 could not be classified in any of sub-groups of red-green colour vision defects (0.246%).

Table 3: Incidence of different types of colour blind subjects among 2030 subjects, irrespective of their sex

Type of colour blindness	Number of subjects	Type of colour blindness
Mild Protans	9	0.440%
Mild Deutans	20	0.985%
Strong Protans	7	0.34%
Strong Deutans	6	0.295%
Tritan	1	0.049%
Unclassified	5	0.246%

DISCUSSIONS

Colour blindness is most frequently inherited as sex-linked recessive disorder. Its incidence is much more common in males as compared to females, as reported by a number of authors who studied the incidence of colour blindness in different parts of world and different castes and regions of India. The incidence in the present study in males was found to be 2.48% and in females 0.00%. The incidence of colour blindness amongst different immigrant populations in Punjab was found and compared amongst each other. According to our study, maximum incidence of colour blindness is found in Bihar (2.79%) and minimum in H.P. (1.62%). The Statistical Analysis showed that the incidence of colour blindness amongst different immigrant populations and according to the geographical distribution of immigrant population was non-significant.

The results of the present study in the immigrant populations in Punjab were relatively lower than the results of some of the workers in India and the world. An incidence of 8.72 % in young Jordanian males (Al-Aqtum *et al.,* 2001) and incidence of 8.18% was reported in males in Tehran (Modarres *et al.,* 1996). An incidence of 4.69% in Tormes-Alberche Valley in Central Spain (Cabrero *et al.,* 1997), 3.83% in Jat Sikh males in Punjab (Naresh, 1995) and 4.2% in Ehiopians (Zein, 1990) has been observed. While an incidence of 5.85% in 49 males was observed with 1.55% and 4.3% of the males exhibiting protan and deutan defects, respectively (Matthew and Abdullah, 2008). On the other hand, the incidence in present study is higher than an incidence of 2.209% and 1.841 % in Indian and ethnic Libyan male populations respectively in a comparative study of the incidence of colour blindness between sections of Libyan and Indian populations (Rahman *et al.,* 1998).

In a study on school going children in Nepal, it was observed that among the total students examined, 2.1% had some form of colour vision defects. Of the male population, 3.9% had colour vision defects while none of the female was found with the deficiency (Shrestha *et al.,* 2010). The incidence of colour blindness in females in our study is 0.00%, which is in agreement with studies done by other authors (Cabrero *et al.,* 1997; and Shrestha *et al.,* 2010). But some researchers have found incidence of colour blindness in females higher than the incidence reported in our study. An incidence of 0.33 % in females of Jordan (Al-Aqtum *et al.,* 2001), 0.43% in females of Tehran (Modarres *et al.,* 1996), 0.13% in Jat Sikh females in Punjab (Naresh, 1995), 0.20% in Ethopian females (Zein, 1990) and 0.84% in Indian female population (Rahman *et al.,* 1998) have been reported.

This difference in the frequencies of colour blindness in the two sexes can be explained on the basis of heredity of colour vision deficiencies. These different studies indicate the prevalence of congenital colour 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 colour-blindness in males in various regions and in various communities of India than that of the findings in other regions of the world.

CONCLUSIONS

The male population suffers from the congenital colour vision disorder. Those with congenital colour vision disorder should be properly counseled regarding difficulties in everyday work, their future profession, genetic inheritance to their children, which would prepare them for the any future challenges and confusions.

REFERENCES

Al-Aqtum MT and Al-Qawasmeh MH (2001). Prevalence of colour blindness in young Jordanians. *Ophthalmologica* **215**(1) 39-42.

Cabrero FJ, Ortiz MA, Mesa MS, Fuster V and Moral P (1997). Red–green colour blindness in the Tormes –Alberche Valley (Avila –Central Spain). *Anthropol Anz* **55**(3-4) 295-301.

Delpero WT, O'Neill H, Casson E and Hovis J (2005). Aviation-relevent epidemiology of colour vision deficiency. *Aviation Space and Environmental Medicine* **76**(2) 127-33.

Guest M, D'Este C, Attia J, Boggess M, Brown A, Tavener M, Gibson R, Gardner I, Harrex W and Ross J (2011). Impairment of colour vision in aircraft maintenance workers. *International Archives of Occupational and Environmental Health* **84**(7) 723-33.

Matthew Oriowo and Abdullah Z Alotaibi (2008). Colour vision screening among Saudi Arabian children. *South African Optometrist* **67**(2) 56-61.

Modarres M, Mirsamadi M and Peyman GA (1996). Prevalence of congenital colour deficiencies in secondary-school students in Tehran. *International Ophthalmology* **20**(4) 221-2.

Naresh S (1995). Study of colour blindness in Jat Sikhs. *Indian Journal Physiology Phamacology* **39** (2) 127-30.

Rahman SA, Singh PN, Nanda PK (1998). Comparison of the incidence of colour blindness between sections of Libyan and Indian populations. *Indian Journal of Physiology Pharmacology* **42**(2) 271-5.

Shrestha RK, Joshi MR, Shakya S and Ghising R (2010).Colour Vision Defects in School Going Children. *Journal of Nepal Medical Association* **50**(180) 264-6.

Verriest G, Neubauer O, Marré M and Uvijls A (1980). New investigations concerning the relationships between congenital colour vision defects and road traffic security. *International Ophthalmology* **2** 87-99.

Zein ZA (1990). Gene frequency and type of colour blindness in Ethiopians. *Ethiopian Medical Journal* **28**(2) 73-5.