

# STUDY OF COLOUR BLINDNESS IN SCHOOL CHILDREN

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**Summary:** Of the 1553 male and 519 female students in schools of Patiala, between the age group of 10 and 15 years, 3.85% males and 0.38% females were found colour-blind. The students were tested by Ishihara Charts, Edridge Green Lantern and then assayed by Pickford Nicolson Anomaloscope and the results were presented in detail. In addition, the affected students were also tested for their acuity of vision and were found normal.

**Key words :** anomaloscope                      Ishihara charts                      Edridge Green Lantern  
trichromats                                      dichromats                              monochromats

## INTRODUCTION

A number of workers have carried out assay of colour blindness and found variable incidences in different parts of the world as well as in different regions of India (1-8). Pickford (9) reported that incidence of red-green blindness is higher among the Europeans and American Whites (7-8%) than among the Asiatic Indians (4-5%) and American and Australian Indians (2-3%). Post (11) mentioned that colour blindness is more common in advanced cultured generations.

The reported higher incidence of colour blindness in France in mediterraneans and English Channel's Littorals was interpreted by him as associated with waves of immigration of more advanced cultures. Gross cultural studies on school-going students, are, however, lacking. The present work is an attempt in this direction where students from different medium schools in Punjab have been investigated for colour blindness.

## MATERIALS AND METHODS

2072 students, between the ages of 10-15 years and of either sex, from the schools of Patiala were tested for colour-vision by Ishihara Charts, Edridge Green Lantern and were assayed in detail with anomaloscope. Acuity of vision was also tested to note the error due to refraction.

In Ishihara Chart Test the first 25 plates were used. In the Edridge Green Lantern test the lantern is placed at a distance of six meters and the subject is asked to identify the signals of various colours and various natural conditions like fog, rain, mist, dust and dawn etc. The test is carried out in dark room.

In the Pickford Nicolson's anomaloscope (10), three tests were performed in which a red/green, a green/blue and a yellow/blue equations were used respectively. It measures the individual differences in colour vision and colour blindness.

All the three tests were carried out with Pickford Nicolson's anomalscope and both the eyes were tested separately using different equiations. The results are shown in Tables I and II.

TABLE I : Showing the incidence of colour defects in 1553 male students.

Type of colour defect		Percentage
1. <i>Anomalous trichromatism</i>		
(a) Protanomaly	(i) Simple	0.19
	(ii) Extreme	0.13
(b) Deuteranomaly	(i) Simple	0.19
	(ii) Extreme	0.06
2. <i>Dichromatism</i>		
(a) Protanopia		0.90
(b) Deuteranopia		2.25
(c) Tritanopia		0.13
Total		3.85

TABLE II : Showing the incidence of colour defects in 519 female students.

Type of colour defect		Percentage
1. <i>Anomalous trichromatism</i>		
(a) Protanomaly	(i) Simple	Nil
	(ii) Extreme	Nil
(b) Deuteranomaly	(i) Simple	0.19
	(ii) Extreme	Nil
2. <i>Dichromatism</i>		
(a) Protanopia		0.19
(b) Deuteranopia		Nil
(c) Tritanopia		Nil
Total		0.38

## RESULTS

Of the 2072 students (519 girls and 1553 boys) tested for colour vision, 60 boys and 2 girls were found colour blind giving an incidence of 3.85% and 0.38% respectively. All the affected students were tested for acuity of vision (both near and distant) and it was normal in all the cases. On Ishihara Chart test, it was found that most of the affected students were red/green blind. Two students were found to be blue-blind. All the students had bilateral defect.

The incidence of colour blindness was higher in students studying in English medium schools (5.6%; 18 out of 339 students) than that of ordinary schools (i.e. 42 out of 1214; 3.46%).

As tested by Edridge Green Lantern, out of 62 affected students as many as 40 were green blind (4 partial green blind), 20 were red blind (3 partial red blind), and 2 were blue blind.

As most of these students were red and green blind, this result is also represented graphically showing red/green matching and mid-matching points in Fig. 1 as tested by Anomaloscope.

Matching range & mid-points for 62 affected students on the Pickford-Nicolson anomaloscope using red-green equation.

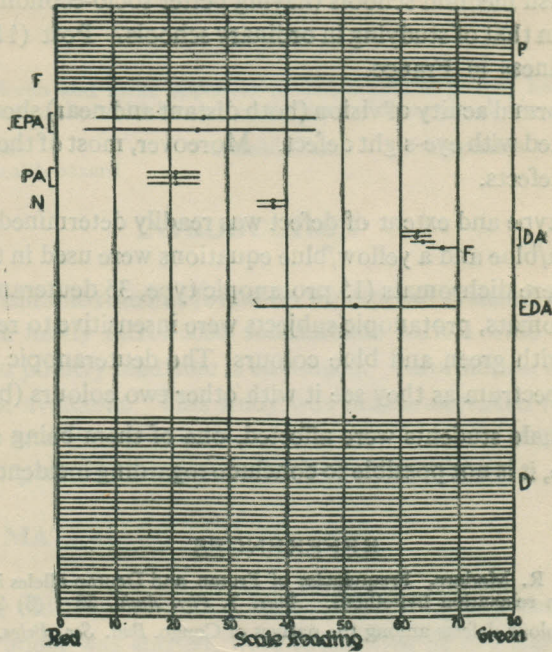


Fig. 1

## DISCUSSION

In the present study, the frequency of colour blindness was 3.85% in males and 0.38% in females. The percentage incidence in the present study appears to be lower than 4.7% observed in males in Bedvin (Sanai) and in Urban Maxicans where it ranged from 4.7 to 7.7% (8). On the other hand, incidence was lower (1.85%) in Congolese (2), 2.3% in Tribal Maxicans, (8), and 1.86% in the people of Uganda (14). Incidence in our series is almost similar to 3.6% observed in Japan (13), and 3.7% in Chinese (5). American Negroes also showed comparable incidence of 3.71% colour blindness (6).

There is less variation of incidence of colour blindness in different parts of India and in various communities than that in other parts of the world. Ramchandriah (12) reported an incidence of 4.66% in male school children. Bansal (3) reported incidence of 5.03% in male Punjabies, while Bhasin (4) showed an incidence of 4.28% in male newars of Nepal and Tiwari (15) showed still higher incidence 4.98% in Tibetians. Dutta and Kumar (7) reported an incidence of

2.86% in 243 brahmins examined by them. They also examined male students where incidence was 3.19%.

Dutta and Kumar (7), Bhasin (4) and Tiwari (15) reported 0.0% incidence in females, while Bansal (3) found frequency of 1.13% among 441 female Punjabies showing comparatively higher incidence. In the present study, the incidence in females was much less i.e. 0.38%.

Other factor which was observed in our series was that the incidence was higher among students studying in English medium schools (having better socio-economic status and of relatively advanced culture) than that of studying in ordinary schools. Post (11) also reported similar incidence of colour blindness in France.

All the cases had normal acuity of vision (both distant and near) showing thereby that colour blindness is not associated with eye-sight defect. Moreover, most of the subjects were unaware of their colour vision defects.

The distinction of type and extent of defect was readily determined by anomaloscope (10) where a red/green, a green/blue and a yellow/blue equations were used in the present study. Most of the affected students were dichromats (15 protanopic type, 35 deuteranopic and 2 tritanopic). In different types of dichromats, protanopic subjects were insensitive to red colour and match the spectrum as they see it with green and blue colours. The deuteranopic subjects are insensitive to green and match the spectrum as they see it with other two colours (blue and red).

Since only two female students were affected, one of them being simple deuteranomalous and other protanopic type, it is not possible to conclude regarding incidence of colour blindness in females from this data.

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