

**A Cross-Sectional Study on Assessment of Colour Vision among Indian Medical School Attendees****Shital A. Patel<sup>1</sup>, Dhatmishtha Dodiya<sup>2</sup>, Sangeeta Chinchole<sup>3</sup>, Babita Bansal<sup>4\*</sup>, Deepak Agrawal<sup>5</sup>**<sup>1</sup>Assistant professor, Department of Physiology, Narendra Modi Medical College, Maninagar, Ahmedabad<sup>2</sup>Assistant professor, Department of Physiology, GMERS Medical College, Junagadh<sup>3</sup>Assistant Professor, Department of Physiology, NSC Government Medical College, Khandwa<sup>4\*</sup>Associate Professor, Department of Physiology, Gian Sagar Medical College and Hospital, Ramnagar, Rajpura, Patiala<sup>5</sup>Associate Professor, Department of Orthopaedics, Adesh Medical College and Hospital, Mohri, Shahbad

Received: 06-09-2023 / Revised: 19-09-2023 / Accepted: 21-09-2023

Corresponding author: Dr. Babita Bansal

Conflict of interest: Nil

**Abstract:****Background and Objectives:** A reduced ability to distinguish between certain colours is called colour blindness. Colour-blind person is unable to perceive one or other primary colour depending upon loss of normal function or deficiency of cones. The main objective of the study to assess the colour vision in Indian medical school attendees.**Material and Methods:** In this, observational study total 1320 participants enrolled from both sexes. Colour vision was assessed by Ichihara charts available in standard format.**Results:** A total 1320 candidates 770 (58.33%) were males and 550 (41.66%) were females, out of these total 28 (3.63%) males and 4 (0.72%) females found to be defective in colour vision.**Conclusion:** This study demonstrates prevalence of defective colour vision more common and profound in males as compared to females.**Keywords:** Assessment, colour vision, Ishihara chart, colour blindness.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

**Introduction**

Color vision is tested as part of routine health check of persons entering government jobs or joining a professional course. It is particularly important in the following groups of people: 1. Drivers of air, sea, and road transport vehicles, railway engine drivers, bus and truck drivers, pilots, etc. Abnormal colour vision is present as an inherited defect. Basically colour vision tested by three methods name as Ishihara charts, Edridge-Green Lantern and Holmgren's wools (Yarn matching test) [1].

Color vision deficiency (CVD), representing a group of conditions that disturbs perception of colour, affects approximately one in 12 men and one in 200 women in the world [2].

In general, people with CVD might encounter many challenges in their daily activities as well as in education. Certain subjects are problematic, which makes them less effective in their work than their colour-normal peers. Medical doctors, in particular, may have difficulty in interpreting

various physical signs during examination, and in identifying colour slides and specimens [3].

Thus, the early detection of CVD is necessary for the person to choose the career option commensurate with his colour vision or lack of it [4]. CVD is X linked recessive disorder hence it is more common in males

**Material and Methods:**

This study was carried out in medical institution to assess the colour vision among medical school attendees. In present study total 1320 medical students were asses for colour vision. Normal screening was done to select the study subjects. Only apparently healthy subjects enrolled for colour vision evaluation. Study subjects who are on any medication or any history of systemic illness past or present was excluded. Prior informed consent and nature of test explained to all subjects.

Ishihara's plates in a room with adequate daylight test colour vision of the candidates. The plates are held at a distance of 75 centimetres (cm) from the

candidate and positioned perpendicular to the line of vision of the candidate. Candidates have to identify the numerals on the plates within 3 seconds. Interpretation as to whether a candidate is having CVD or not is done according to the

instructions provided along with the plates (Table 1: as per checklist given below) and total number of candidates and those with CVD were tabulated according to the age and gender in data sheet.

**Table 1: Colour vision - checklist**

Plate	Expected Answer	Your Answer	Check list 1	Person with Red-Green Def.	Check list 2	Person with total CB and weakness	Check list 3
1	12			12		12	
2	8			3		×	
3	6			5		×	
4	29			70		×	
5	57			35		×	
6	5			2		×	
7	3			5		×	
8	15			17		×	
9	74			21		×	
10	2			×		×	
11	6			×		×	
12	97			×		×	
13	45			×		×	
14	5			×		×	
15	7			×		×	
16	16			×		×	
17	73			×		×	
18	×			5		×	
19	×			2		×	
20	×			45		×	
21	×			73		×	
			<b>Protan</b>		<b>Duetan</b>		<b>Remarks</b>
			<b>Strong</b>	<b>Mild</b>	<b>Strong</b>	<b>Mild</b>	
22	26		6	(2)6	2	2(6)	
23	42		2	(4)2	4	4(2)	
24	35		5	(3)5	3	3(5)	
25	96		6	(9)6	9	9(6)	

The mark × shows that the plate cannot be read. The numerals in parenthesis show that they can be read but they are comparatively unclear.

### Results

The study encompassed 1320 medical school attendees, out of this 770 (58.33%) were males and 550 (41.66%) were females. The mean age of study subjects 18.25±0.345 years. In studied subjects total twenty-eight (3.63%) out of 770 males found to be CVD, while total four (0.72%) out of 550 female found to be CVD (Table 2).

**Table 2: Observation and results of colour vision**

	Male	Female
No. of study subjects	770	550
No. of person having defective color vision	28	4
% of defective color vision	3.63	0.72

### Discussion

Knowledge about the CVD at an early age can help in choosing the proper career for a child as well as enrol in human trial for its treatment by gene therapy [4]. Around 2% of males have red-green dichromacy, which is a genetic disorder of colour vision where one type of cone photoreceptor is missing [5]. Normal humans exhibit high colour-

vision sensitivity as they discriminate the colour of spectral flashes at detection-threshold intensity however the dichromate need much higher stimuli to perceive certain colours [6].

Previous research shows that colour blindness is more common in male as compared to females, about 8% of males are colour blind while 0.6% of females are colour blind. 3437 persons underwent

pre-employment screening during 2013 and 2014; 1837 (53.44%) were males and 1600 (46.65%) females. The mean age was 29.01 ( $\pm 6.53$ ) years. A total of 0.9% (32/3437) persons had colour vision deficiency with male being 1.4% and female 0.4% [7]. A total of 2001 students were examined (Nepal Medical Association), of the male population, 3.9% had colour vision defects while none of the female was found with the deficiency [8]. The prevalence of congenital colour vision deficiency in the 1,300 primary school screened was 2.6%, with males having a significantly higher prevalence than females [9]. A recent study demonstrates that colour preferences of red-green dichromats differ systematically from colour preferences of typical trichromatic observers [10]. It is estimated that inherited red-green colour deficiency, which involves both the protan and deutan deficiency types, is common in men [11].

The prevalence of colour blindness was significantly more among males (4.6%) compared to females (1.7%). Furthermore, the different types of anomalies were significantly more among males compared to females [12]. Most of numbers of current study matched with past study, which was studied in India and in other country across the world.

### Conclusion

In present study we conclude that CVD is, exist in normal population. CVD is more common and profound in male as compared to female. Test for

CVD has great importance to choose the occupation and future carrier.

### References

1. Cl ghai. Textbook of practical physiology. Jaypee pub. 8<sup>th</sup> ed: 211–215.
2. Colour Blindness. Colour Blind Awareness Organization. [Last accessed on 2020 Jun 06]. Available from: [https:// www. Colour blind awareness.org/colour-blindness/](https://www.colourblindawareness.org/colour-blindness/).
3. Dhingra R, Rohatgi J, Dhaliwal U. Preparing medical students with congenital colour vision deficiency for safe practice. *Natl Med J India*. 2017; 30:30–5.
4. Kundu BK, Chakma B. Prevalence of colour vision defect in the Indian population - results from a preemployment screening centre of a tertiary care hospital. *International Journal of Contemporary Medical Research* 2020;7(9): I19-I23.
5. *Proc Natl Acad Sci U S A*. 2015 Jul 28; 112(30):9316-21.
6. Van Arsdell RE1, Loop MS
7. *Pak J Med Sci*. 2017 Mar-Apr;33(2):430-432.
8. *JNMA J Nepal Med Assoc*. 2010 Oct-Dec; 50(180):264-6.
9. *Niger J Med*. 2008 Oct-Dec; 17(4):428-32.
10. *Trends Cogn Sci*. 2015 Oct; 19(10):554-5.
11. *PeerJ*. 2016 Dec 8;4: e2751. eCollection 2016.
12. Jaikhani H, Tityal GS, Mehrotra N. To Study the Prevalence of Color Blindness among Adolescent (9th–12th Std.) Schoolchildren in Haldwani. *Int J Sci Stud* 2021;8(10):108-114