

Original Article

## AWARENESS AND KNOWLEDGE OF COLOR VISION DEFICIENCY AMONG HEALTH CARE STUDENTS WITH INTERVENTION

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### ABSTRACT

**Objective:** To assess the level of awareness and knowledge of Color Vision Deficiency and to determine problems related to color vision among health care students.

**Methods:** This study was done on 278 Health care students in the age group of 18 to 25 y. Structured Pre and Post assessment questionnaires were administered to all consenting students to determine the prevalence of Color Vision Deficiency and a video is shown to assess the level of awareness and knowledge of Color Vision defects. Color Vision was tested by using Ishihara Color Vision Chart. This study was conducted between November 2021 to January 2022. Ethical clearance for the study was obtained from Saveetha College of Allied Health Sciences.

**Results:** A total of 278 subjects participated in this study, 277(99.6%) subjects have a normal level of Color Vision. Around 66.5% of subjects were aware of color vision deficiency in pre-assessment and 100% of subjects were aware in post-assessment, around 99.6% of subjects found no difficulty in choosing colors of clothes, cosmetics, 100% of subjects had no color difficulty in previous and daily work/study activities and among them, one subject (0.35%) could not appreciate color considered as total Color blindness according to the chart used.

**Conclusion:** It is concluded from this study that a large group of students attains a normal level of Color Vision. Most of them (66.5%) are aware of Color Vision deficiency in pre-assessment, after providing them with adequate awareness and knowledge increases to 100% in post-assessment.

**Keywords:** Color vision deficiency, Awareness, Ishihara chart, Health care student

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### INTRODUCTION

Color vision is the ability to perceive and discriminate between light based on wavelength composition [1]. The Human retina contains photoreceptors; Rods and cones, which are responsible for night/dark vision and color vision respectively [2]. Among those photoreceptors, cones are missing or not working correctly in Color Vision Deficient Patients [3]. Color vision abnormalities can be either hereditary or acquired [4]. Color vision defects are inherited as X-linked recessive disorder, which explain its predominance among males [5]. Acquired color vision deficiency may occur as a secondary feature to pathology and can arise any time throughout life as a result of systemic or ocular disease, trauma, etc [6]. Acquired color blindness is usually blue-yellow [7]. Any cone pigment is absent and this is termed anopia and examples include deuteranopia, protanopia and tritanopia [8]. Color vision deficiency affects medical students resulting in poor clinical examination and color appreciation [9]. Therefore, medical students must be made aware of their limitations and become more alert during their clinical practices.

### MATERIALS AND METHODS

This is a questionnaire and cross-sectional study which was carried out among 278 health care students of Saveetha College of Allied Health Sciences from November 2021 to January 2022, age group between 18-25 y with a mean±Standard deviation of 20.00+/-1.37, include 106 males and 172 females. Informed consent was obtained from all subjects and this study has been approved by the IRB committee of Saveetha College of Allied Health Sciences. Simple Random Sampling was used to find out the sample size (n=278). Emmetropic and refractive error subjects were included in the study. Subjects on Psychoactive substance use, smokers, alcoholics, and subjects using tinted spectacles were excluded from this study. A Questionnaire was prepared with corresponding 15 questions related to awareness about color vision deficiency and problems

encountered in their daily activities based on colors and students were asked to fill out Pre and Post questionnaire forms. All the Students underwent Color vision testing using Ishihara's Pseudo-isochromatic chart. Ishihara chart was placed at a distance of 75 cm and tilted at a right angle to the line of vision. Performed by using the Ishihara chart. The full test consists of 38 plates, out of the initial 21 plates, if 17 or more plates are read correctly by an individual his color sense should be regarded as normal. Color deficient individuals are retested for confirmation and subjected to refraction and correction, Slit-lamp biomicroscopy and fundus examination ensure that no ocular abnormality was present.

### RESULTS

A total of 278 Health care students were participated in the study. Among them 61.8% were females and 38.12% were males and the same was depicted in the fig. 1

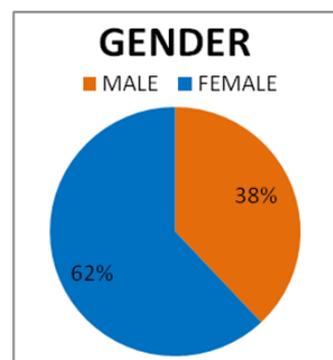


Fig. 1: Distribution of gender among health care students

Table 1: Distribution of gender

Gender	Number of respondents	Percentage
Male	106	38.12%
Female	172	61.8%
Total	278	100%

Table 2: Distribution of color vision among health care students

Gender	Number of respondents		Percentage	
	normal	abnormal	Normal	Abnormal
Female	172	0	61.8%	0%
Male	105	1	37.7%	0.35%
Total	277	1	99.6%	0.35%

Among 278 students 1 student was found to be colorblind accounting for a prevalence of 0.35%.

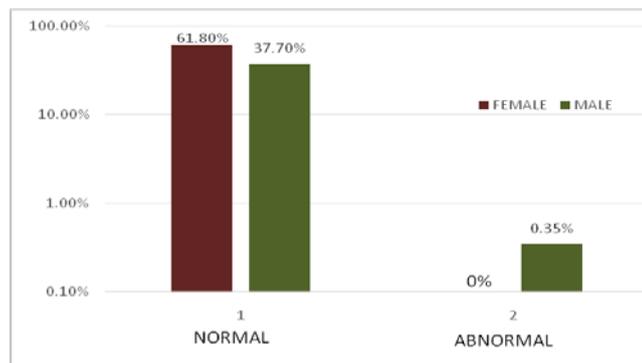


Fig. 2: Distribution of color vision among health care students

Table 3: Pre and post-assessment of color vision questionnaire

S. No.	Questions	Number and percentage	
		Pre-assessment	Post assessment
1.	Is there any consanguinity between your mother and father?		
	Yes	(39)14%	(35)12.5%
2.	Do you have any family history of color vision deficiency?		
	Yes	(0)0%	(0)0%
3.	Do you know what color vision deficiency is?		
	Yes	(185)66.5%	(278)100%
4.	Have you previously experienced color vision test?		
	Yes	(99)35.6%	(121)43.5%
5.	When was color vision test performed?		
	Entering school	(21)7.50%	(24)8.60%
6.	Do you have any difficulty in choosing colors of clothes, cosmetics and groceries ?		
	Yes	(1)0.35%	(1)0.35%
7.	Do you have any difficulty in distinguishing colors of threads, paints during your work activities?		
	Yes	(0)0%	(0)0%
8.	Do you have any difficulty in the satisfactory adjustment of tv color balance?		
	Yes	(1)0.35%	(1)0.35%
9.	Do you have any difficulty in recognizing skin conditions such as rashes?		
	Yes	(1)0.35%	(1)0.35%
10.	Do you have any difficulty with colors while working on computer?		
	Yes	(0)0%	(0)0%
11.	Do you have any color difficulty in the previous study/work activities?		
	Yes	(0)0%	(0)0%

S. No.	Questions	Number and percentage	
		Pre-assessment	Post assessment
12.	No	(278)100%	(278)100%
	Do you have any color difficulty in daily work/study activities?		
13.	Yes	(0)0%	(0)0%
	No	(278)100%	(278)100%
14.	Do you have any difficulty in identifying flowers based on colors?		
	Yes	(0)0%	(0)0%
15.	No	(278)100%	(278)100%
	Difficulty in distinguishing medications because of their colors?		
15.	Yes	(0)0%	(0)0%
	No	(278)100%	(278)100%

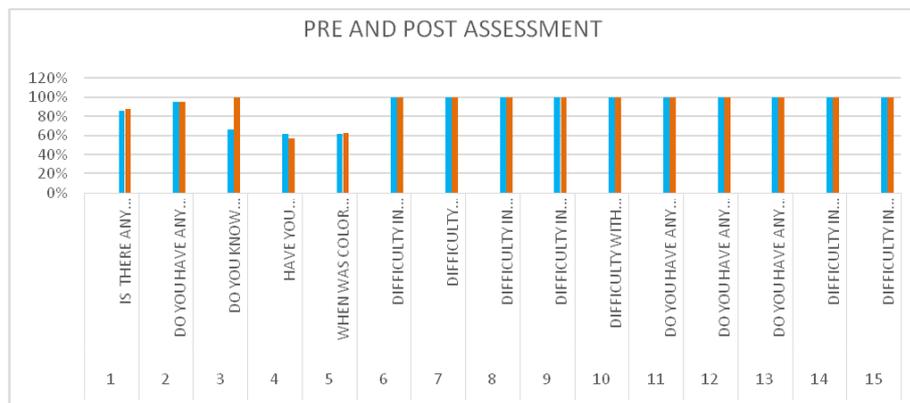


Fig. 3: Pre and post assessment of color vision deficiency questionnaires among health care students

It is observed from that our result, that 94.6% of health care students had no family history of color vision deficiency. Among our students, 66.5% of subjects were aware of color vision deficiency in pre-assessment and 100% of subjects were aware of color vision deficiency in post-assessment. 61.80% subjects among our cohorts never experienced color vision tests before.

Among our cohorts it is observed that 99.6% of subjects had no difficulty in choosing colors of clothes, groceries recognizing skin conditions such as rashes and 100% of students had no difficulty in distinguishing colors of threads, paints during their work activities, identifying colored flowers, medication based on their colors, watching sports activities because of sport shirt colors.

The highest percentage from above 15 questions in pre and post-assessment results are represented graphically in fig. 3.

## DISCUSSION

Color Vision is the ability to perceive and discriminate between light based on wavelength composition. Colors are perceived by cones and signals are generated which are mixed by the brain and create a wide spectrum of colors that we perceive. Color Vision abnormalities can be either inherited or acquired. Inherited color vision deficiency is most likely to affect males. Some people are affected by color vision deficiency, but they remain undetected because of their unawareness of the disease. So, screening for medical professionals is important as it becomes important for them in interpreting color-coded signs. Therefore, Health care students must be made aware of the color vision deficiency and become more alert during their clinical practices.

In this study a pre questionnaire google form has been sent to health care students with 15 questions along with options data is collected and then a video is shown to create awareness followed by a post-assessment of the questionnaire. Along with google forms, color vision is tested by using the Ishihara color vision chart. Results show that 66.5% of health care students are aware of color vision deficiency in pre-assessment and after color vision deficiency awareness followed by post-assessment in which the result improves up to 100%.

Among the total of 278 students, 1 student was found to be color-blind accounting for a prevalence of 0.35%, and the remaining 99.6% of students have normal color vision. None of the females were found to be color vision deficient in this study.

Muhammad Imran Qadir *et al.* had undergone a study in the year 2019 on awareness about color blindness among university students, this was a questionnaire study done among university students. The total number of students in this study was 39. He concluded that most students are unaware of the etiology and transmission of color blindness disease while some are fully aware of this disease.

Pujan Bhusal *et al.*, 2020 had undergone a study on color vision deficiency among medical students of Chitwan. This was done among 220 medical students. Ishihara Charts with 24 plates are used to test for color vision deficiency. This study demonstrated the presence of color vision deficiency is more common among males. Moreover, the students were unaware of their condition. Students with Color Blindness should be counseled for their further specialization.

A study was done by Shanmugam Srinivasan *et al.*, in the year 2019 on the Prevalence of congenital color blindness in a tertiary eye care center. This was a cross-sectional study conducted among 3500 cases. Routine ophthalmic examinations were carried out in all cases including slit lamp examinations and color vision tests by Ishihara charts. He concluded that a person with color blindness was not aware of it and would become to know about it only during the interview and ophthalmic check-up. Routine school age group, color vision check-up is mandatory to find out inherited or total color blindness from early stages.

## CONCLUSION

In our study, it was affirmed that most of the students attain the normal level of color vision. Most students were aware of the color vision deficiency while some of them are not fully aware of the disease. After giving appropriate awareness and knowledge by showing them an awareness video, got educated about Color vision deficiency. Therefore, it is concluded from this study Health care

students must be made aware of color vision deficiency, so that they can take special caution in their future clinical practice.

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Nil

**AUTHORS CONTRIBUTIONS**

All the authors have contributed equally.

**CONFLICT OF INTERESTS**

Declared none

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