

Title:

**PREVALENCE OF COLOR VISION BLINDNESS AT AL-QADISIYAH
UNIVERSITY**

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ABSTRACT

Back ground

Color vision blindness is an important X linked autosomal recessive visual defect affecting the perception of colors.

Purpose

To determine the prevalence of color vision deficiency among a sample of medical colleges group in AL-Qadisiyah university (medical colleges , college of pharmacy and nursing college)

Method

Across-sectional study done in AL-Diwaniah city at the period from April 2018 to June. 2018 study carried out to assess the prevalence of color vision deficiency among sample of medical colleges group student a sample of 814 student 252 male and 562 females with age range 18 – 24 years all are examined by Ishihara 38 plates.

Result

The prevalence of color vision deficiency was 5.2% for male and 0.4% for female. Deutan more than protan 11 cases deutan 1 female and 10 male while protan 4 cases 1 female and 3 male. There was no significant relation between color vision deficiency and the degree of relationship of the parents.

Conclusion

Prevalence of color vision deficiency in a sample of medical student is (1.8%) with prevalence in male (5.2%) and in female 0.4% Deutan more than protan. There is no relation between color vision deficiency and the degree of parent relationship.

Key word: Deutan , protan, Color blindness

INTRODUCTION

Color vision deficiency (CVD) is a chief disorder of the vision that affect the ability to notice some colors or pick out their difference.⁽¹⁾

The mammalian retina contain[2]kinds of cells that receive light. They are termed as rods and cone [Rods] can become aware of brightness as well as darkness and are very sensitive to low light level while the Cones cells can detect colors and are concentrated near the center of the vision. [3]kinds of a specific cell which are[cones] that see color: green and red and blue. In the mammalian higher center perception of colors takes place after uses input from these cone cell .⁽²⁾

The Color vision deficiency is happened when one or more of [3]kinds of color receptive[cones]cells red and green as well as blue do not precisely draw together or throw a right color impulses to the optic nerve . The CVD may be hereditary or due to many other causes that affect the color vision. The hereditary kind is habitually linked to the X chromosome red and green CVD so as it is more occurrence in boys than girls, also it may be less frequently an autosomal prevailing quality blue and yellow CVD and so infrequently an autosomal recessive congenital feature[Achromatopsia]total color vision deficiency⁽³⁻⁴⁻⁵⁾.

The Achromatopsic patient is almost always has additional defect with vision including decrease visual acuity and hyper sensitivity to light (photophobia) and small unconscious eye motion (nystagmus)⁽⁶⁾

The inherited type is not pathological . untreatable, and permanent throughout the patient years of life while color vision the defect cause by another causes rather than inherited causes like for example systemic illnesses or injury causing damage to the optic nerve or the retina be capable of defecting the acknowledgment of coloring visualizing. disease like glaucoma, diabetes mellitus, neurological degenerative diseases , medication with harm full outcome, advancing age , injury .⁽⁷⁾

The condition are divided in to three major categories: red-green CVD . The second categories blue –yellow CVD and a complete absence of color vision a persons with a red-green defect related to a loss or abnormality of the red sensitive pigment are said to have protan defect protanomaly and protanopia according to the severity of defect while those with loss or abnormality of the green sensitive cone pigment have a deutan defect also according to the severity (deuteranomalous and deteranopia). Yellow-blue CVD is a tritan defect also either tritanomalous or tritanopia.⁽⁷⁾ a good number widespread CVD is the red and green color which is called Daltonism⁽⁸⁻⁹⁾ The deficiency of red green color with it is sub type further widespread than blue(CVD) that is so less frequent.⁽¹⁰⁻¹¹⁻¹²⁾

SUBJECT AND METHOD

Across sectional study designed to found the prevalence of CVD among a sample of student in the medical colleges group at AL-Qadissiyah university in a period from April 2018 – June. 2018 a sample of 814 student 562 female and 252 male with average age of 18 – 24 years mean age of 20.82 ± 1.58 have been examined after taking their permission for examination and including in the study. Data were collected using a pre-constructed data collection form, which was formulated for the purpose of this study. The general characteristic of the collection formula were

- 1- Name.
- 2- Age.
- 3- Gender.
- 4- Occupation.
- 5- Past medical history.
- 6- Past ocular history.
- 7- Family history.
- 8- Dose the parent relative or not? first and second degree relative considered as positive any other considered negative.
- 9- Result of examination.

Inclusion Criteria

- 1- Healthy student age 18 – 24 years.
- 2- Visual acuity not less than 6/6 or corrected by spectacle or contact lenses.

Exclusion Criteria

- 1- Student with history of ocular Trauma or surgery.
- 2- History of medical diseases like Diabetes or Hypertension.
- 3- History of using drug that affect color vision like digoxin , anti-epileptic drug and barbiturate.

Way Of Examination

All student after taking their permission for examination are examined for visual acuity using Snellen chart. CVD was tested by using pseudo-iso chromatic Ishihara plates which is a good and quick process of examine the defected of color vision from that vision which is normal . we consider using Ishihara plates of 38 plate were used by putting the plate in front of the Student at 70cm in the day light not direct sun light . Each plate have been offered to the student for three to four seconds and they were asked to read all numbers presented in the plate .

Plates from one to twelve revealed the normality or abnormality of color vision if 17 plates reads correctly this mean normal color vision, when the student see thirteen or less this mean defect in color vision red - green defect. The plate 22 to 25 were used to differentiate red color defect kind and green color defect kind.^[13] The plate 30 to 38 were used when the patient cannot read the number in plates determined the lines between a two X should be done and completed at ten seconds . Finally the result of an examination were collected in preformed formula analysis statistically by soft were programmed version 23.

RESULTS

Distribution Of Study Sample According To Age And Gender

The study, as stated in the chapter of patients and methods, included 814 students with a mean age of 20.82 ± 1.58 years and an age range of 18 to 24 years. Male subjects comprised 252 out of 814 (31.0 %), whereas, female subjects contributed to 562 out of 814 (69.0%). Mean age of male subjects was not significantly different from that of female subjects, 21.52 ± 1.56 years versus 20.51 ± 1.49 years, respectively ($P=0.137$), as shown in table 1.

Table 1: Mean age and gender of subjects enrolled in the present study

Gender	<i>n</i>	Mean Age	SD	Minimum	Maximum	<i>P</i> *
Male	252	21.52	1.56	18	24	0.137 NS
Female	562	20.51	1.49	18	24	
Total	814	20.82	1.58	18	24	

N: number of cases; SD: Standard deviation;* Independent samples t-test; NS: not significant

Rate Of Color Blindness

The rate of color blindness in the study sample was 15 out of 814 (1.8%), as shown in figure 1. Patients with protan (red color) blindness accounted for 4 out of 814 (0.5%), whereas, patients with deutan (green color) blindness were more frequent and accounted for 11 out of 814 (1.3%), as shown in figure 1 and table 2.

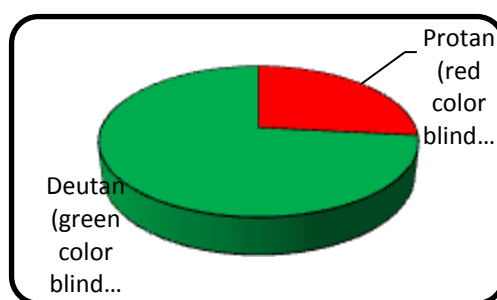


Figure 1: Pie chart showing the proportion of patients with protan (red color) and deutan (green color) blindness

Table 2: Proportions of patients with color blindness

Characteristic	<i>n</i>	% out of total	% out of patients
Color blindness	15	1.8	100
Protan (red color)	4	0.5	26.7
Deutan (green color)	11	1.3	73.3

- No case of total CVD is found
- No blue – yellow CVD can be detected.

Correlation Between Age And Color Blindness

Mean age of all patients with color blindness was 21.33 ± 1.68 years, whereas, mean age of normal subjects was 20.81 ± 1.58 years and there was no statistical difference in mean age between patients with color blindness and normal subjects ($P=0.205$), as shown in figure 2. Mean age of patients with protan (red color) blindness was 20.25 ± 1.26 years and that of patients with deutan (green color) blindness was 21.73 ± 1.68 years and there was no statistical difference in mean age between the two groups ($P = 0.136$), as shown in figure 3.

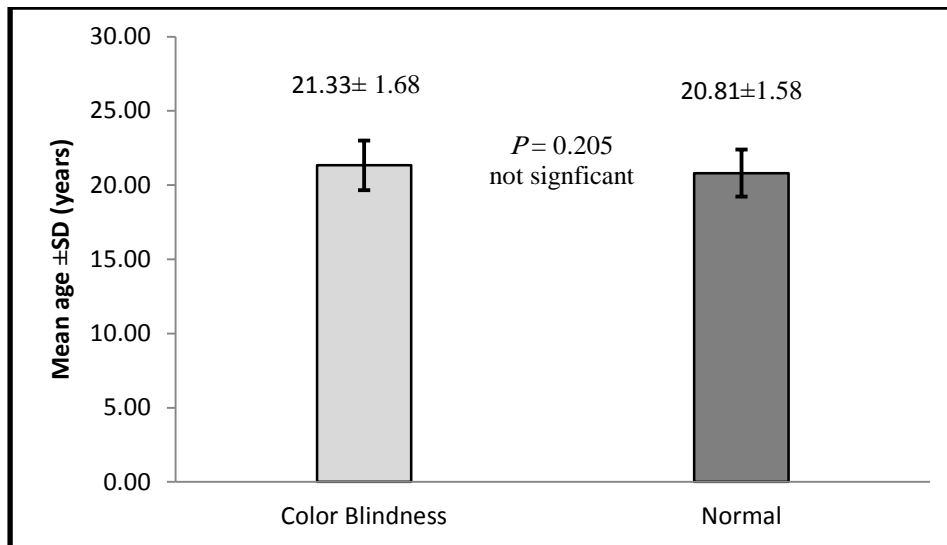


Figure 2: Bar chart showing mean age in patients with color blindness in comparison to normal subjects

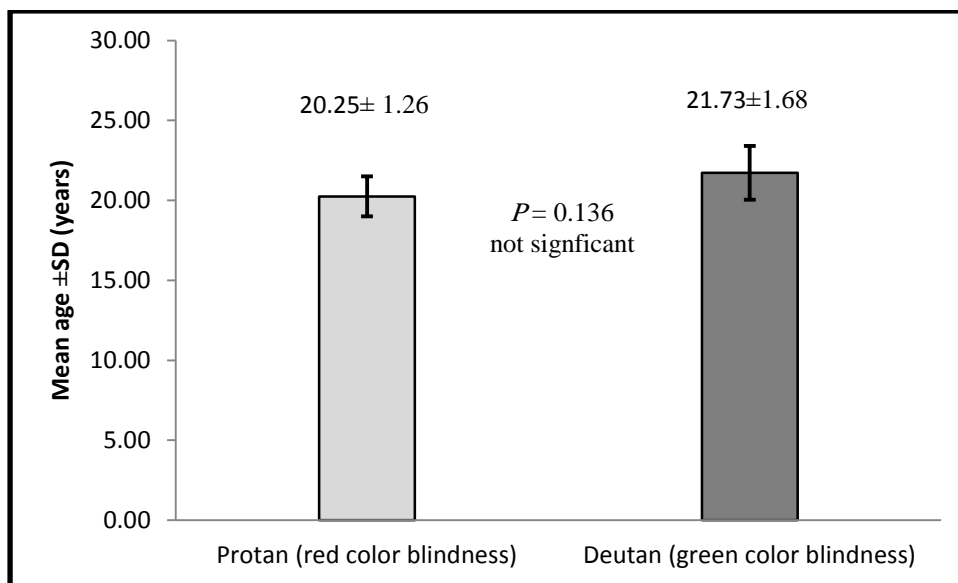


Figure 3: Bar chart showing mean age in patients with protan (red color blindness) versus patients with deutan (green color blindness)

Association Between Gender And Color Blindness

As shown in table3. Out of all patients with color blindness, 13 were male patients accounting for 5.2% out of all male participants and 2 were female patients accounting for 0.4% out of all female participants. The difference statistically was highly significance ($P < 0.001$) and the risk of having color blindness was 15.23 in male subjects in comparison with female subjects with a 95% confidence interval of 3.41 - 68.01. On the other hand, patients with protan (red color) blindness included 3 male and 1 female subjects accounting for 1.2 % and 0.2% out of all male and female participants, respectively, the difference was statistically not significant ($P = 0.171$);

however, the risk of having protan color blindness in male subjects was 6.67 in comparison with female subjects with a confidence interval of 0.70 - 65.30. Moreover, patients with deutan (green color) blindness included 10 male and 1 female subjects accounting for 4.0 % and 0.2% out of all male and female participants, respectively, the difference was statistically highly significant ($P < 0.001$); the risk of having deutan color blindness in male subjects was 23.18 in comparison with female subjects with a confidence interval of 2.95 - 182.10.

Table 3: Association between gender and color blindness

Color blindness	Male <i>n</i> = 252	Female <i>n</i> = 562	<i>P</i> *	Odds Ratio	95% CI
All, <i>n</i> (%)	13 (5.2)	2 (0.4)	<0.001	15.23	3.41 - 68.01
Protan, <i>n</i> (%)	3 (1.2)	1 (0.2)	0.171	6.76	0.70 - 65.30
Deutan, <i>n</i> (%)	10 (4.0)	1 (0.2)	<0.001	23.18	2.95 - 182.10

n: number of cases; *Chi-Square after Yates correction for continuity; CI: confidence interval

Association Between CVD And Parent Relationship

We found that 3.3% of cases of CVD have closed relationship parent. 1.2% have no close relationship parent but this difference is not statistically significant (p value = 0.088), as shown in table 4.

Table 4: Association between color blindness and parent whether relative or not

Parent, relative	Total	Positive test	Negative test	χ^2	<i>P</i> *
Yes	244	8 (3.3%)	236 (96.7%)	2.919	0.088 Not significant
No	570	7 (1.2%)	563 (98.8%)		
Total	814	15 (1.8%)	799 (98.2%)		

*Yates corrected Chi-Square test for continuity

DISCUSSION

While the congenital type which is mostly inherited as X linked autosomal recessive disorder ; genetic cause is the common cause of CVD about 8% of Caucasian males are born with same degree of CVD. The females are typically just carriers of CVD gene though about 0.5% of females have CVD.⁽¹⁾ in our study which designed to found the prevalence of CVD among sample of student in the medical colleges group (medical college , college of pharmacy and nursing college) in AL-Qadissiyah university.

We found that male also affected more than female ; out of all student participate in the study (814) student 15 student are color blind; 13 of them were males student accounting for 5.2% out of all male participate (252) and 2 were females student accounting for 0.4% out of all females participates (562). The numbers of female student in the medical colleges group are more than males for this reason the number of female in the sample are more than male. Studying the other researches result for CVD prevalence through out the world shows that it is 0.8 – 9.3% among males and 0.4 – 3.2% among females.⁽¹⁴⁾

Many other studies done in Iraq show result near to our result for example:- prevalence of CVD among the student in Erbil city of 8.47% in male and 1.37% in the females⁽¹⁴⁾.

Among adult in Baghdad were 6.75%⁽¹⁵⁾. Study done in Shekhan city in AL-Duhok province, Kurdistan Region in Iraq show prevalence of 6.36% in male and 0.84% of female of high school student⁽¹⁶⁾.

Another study done at AL-Diwaniah city AL-Qadissiyah province for prevalence of congenital red- green CVD among medical student and medical personal in AL-Diwaniah teaching hospital show 4.8% prevalence among male and 1% among female⁽¹⁷⁾. Other studies in the neighboring countries show the prevalence of CVD either higher or lower than our study for example a study done in young Turkish men show prevalence of 7.3%⁽¹¹⁾, In Saudi Arabia 2.9 – 11% in male⁽²⁰⁻²¹⁾ and among female were 0.35%⁽²⁰⁾

In Iran many studies were done to look for the prevalence of CVD in different cities Mashhad, Qazvion and Teharn the prevalence were in Mashhad 15.85% for male and 12.96% female.⁽²¹⁾ In Qazvin 3.49% of the total population had CVD 2.56% male and 0.93% were female⁽²²⁾. In Tehran 8.18%⁽²³⁾. In Jordan the prevalence was 8.72% in males⁽²⁴⁾

Study for CVD in European countries show in a Denmark male were 8.7% while in Greek males were 7.95%⁽²⁵⁾. In our study the prevalence of female with CVD were 0.4% which is near to the other studies like in Indian population 0.83%⁽²⁶⁾ and the other studies which done in Iraq and Saudi Arabia and Iran were mention previously.

The color vision blind patient will not just confuse red and green only because the peak of sensitivity of red and green cone cells (cone cells present in the center of the retina responsible for color vision) is very close to each other so those person will be unable to discriminate any color which contain red or green for example:- they will see purple as blue because they can not perceive the red part of the light spectrum which is added to blue to from the color purple thus all reds, greens, oranges, browns, purples, blues and grays will be impossible to identify precisely⁽²⁷⁾

In our study we found that deutan CVD (green CVD) is more than protan CVD (red CVD). 11 case from the total student affected. By CVD which are (15) student (10) male and (1) female subject accounting for 4.0% and 0.2% out of all male and female participants, respectively while protan (red CVD) included 3 cases male and 1 case female student accounting for 1.2% and 0.2% out of all male and female participant respectively. The deutan more than the protan.

When we compare with other researches most of them show that also deutan more than types for example in Jordan 12 cases of deutan and 7 cases of protan⁽²⁵⁾

In Erbil deutan more than protan⁽¹⁶⁾. other study in AL-Diwaniah city show 8 cases deutan and 8 cases protan⁽¹⁷⁾. Study done in AL-Duhok province show 14 deutan and 7 cases protan⁽¹⁸⁾. in Turkish show 5.1% protan and 2.23% deutan and this differe than our result.⁽¹⁸⁾ In Indian 7.9% deutan and 3.22% protan⁽²⁷⁾. Study in a Nepal 16 cases deutan and 3 case protan⁽²⁸⁾.

The cause of this classification of CVD as protan and deutan that at first it is the most common CVD the second cause is that we use only Ishihara plate for testing the

CVD which can only used for red – green color blindness not blue – yellow color blindness also it is simple and popular.

CONCLUSION

The prevalence of CVD is 1.8% in total sample of student with a prevalence of 5.2% in male and 0.4% for female student. The Deutans CVD were more the protans CVD deutans 4% in male and 0.2% in females . While protans 1.2% in male and 0.2% in female.

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