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# A Survey On Colorblindness In Pharmacy Students At Wagholi, Pune

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***Abstract:***

*Quantitatively color is used in Pharmaceutical Science & Technology as a tool for identification and differentiation of substances. Color is universal organoleptic characteristics used to recognize exact molecule in particulate & bulk forms. Pharmacists who have colour vision deficiency have some problems while manufacturing medicine, carrying out chemical analysis, colorimetric test, dispensing of medicines. It may be dangerous if Pharmacists use color names to identify medicines to the patients or customers unless they know their patient has normal color vision. Color blindness means that personnel having trouble in differentiating red, green, or blue or a mix of these colors. The aim of the present study is to estimate the number of pharmacy students/personnel having problems in color discrimination based on a color blindness test. In present study it was found that 2.2% of the males were color blind while 1.1% of the females were color blind of population 225 students & staff.*

***Key words:*** *colour vision deficiency, discrimination of colour of medicine, pharmacy students, deuton type*

**1.Introduction**

Color blindness is not 'color blindness'! There are still a lot of people who think that if you are colorblind you really can't see any colors. But the term is misleading, as more than 99% of all colorblind people can see colors. A better wording would be color vision deficiency, which describes this visual disorder more precisely. The most commonly used test to detect color vision deficiencies was developed by the Japanese ophthalmologist **Shinobu** Ishihara (1879-1963).

*1.1.Causes Of Color Blindness*

Color defective vision is either inherited or acquired. Other possibilities for color blindness are also glaucoma, aging, alcohol misuse, or a hard injury on your head.

*1.2.How Color Vision Works*

To see anything at all we need some tiny little helpers inside our eyeballs, the so called photorecptors. There are two different types of them: rods and cones. There are about 120 million rods which are very sensitive to light but not to color. The cone cells are the photoreceptors present on retinal layer of eye responsible for color vision.

*1.3.Types Of Color Vision Deficiency*

- Monochromatism: Either no cones available or just one type of them.
- Dichromatism: Only two different cone types. Third one is missing completely.
- Anomalous trichromatism: All three types but with shifted peaks of sensitivity for one of them which results in a smaller color spectrum. Dichromats and anomalous trichromats exist again in three different types according to the missing cone or in the latter case of malfunctioning.
- Tritanopia/Tritanomaly: Missing/malfunctioning S-cone (blue).
- Deuteranopia/Deuteranomaly: Missingimalfiinctioning M-cone (green).
- Protanopia/Protanomaly: Missing/malfunctioning L-cone (red)

*1.4.Colour Blindness Inheritance Pattern*

It it is sex linked inheritance, controlled by X chromosome. Male has XY set of chromosomes and female with XX. If one of the two X chromosome is defective female will not show CVD but if in case of male X is defective the male is affected. This disorder is passed on from a grandfather to his

grandson, where as the mother is only a carrier of it. A carrier is not affected because the trait is recessive. This causes much more men to be red-green colorblind, and even more women to be carriers of CVD. As it is X linked inheritance females with dominant character shows more colour choice for distinguishing the saree colors than male.

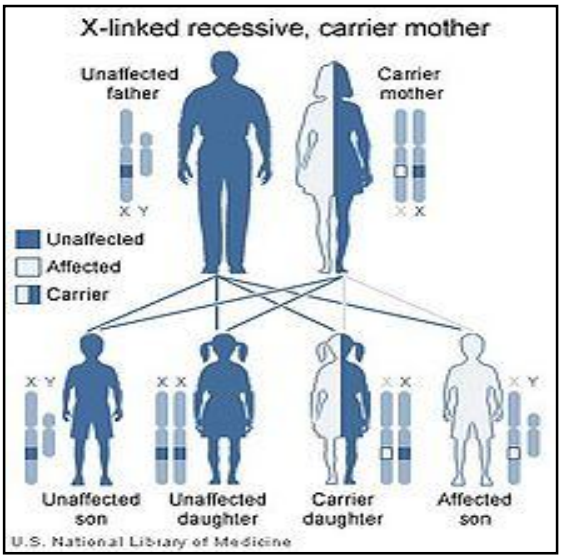


*Figure 1: Red-green colorblindness inheritance pattern*

*1.5.Color Blindness During Experiments*

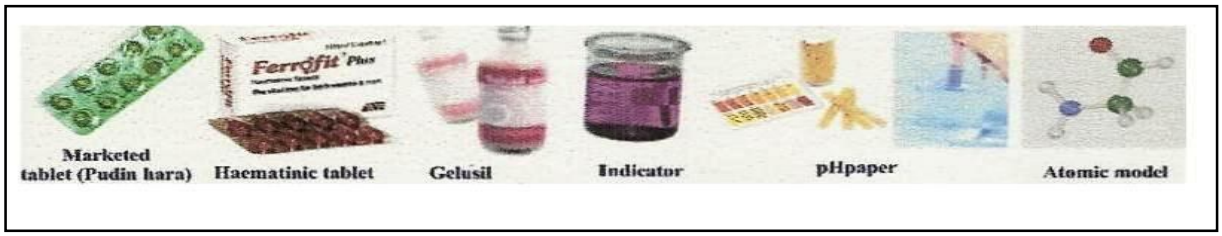


*Figure 2:Varaition & variabilityof Colour pattern for pharmacist in routine practice*

**2.Materials And Methods**

According to what you can see and what not, the test gives feedback of the degree of your red-green color vision deficiency.

The present study was conducted on individuals of pharmacy students and staff from JSPM's Charak College of Pharmacy & Research, Wagholi, Pune. The sample size of 225 was selected for the screening study of colorblindness, comprising of pharmacy students, pharmacy teaching faculty. 135 among the sample size were male and 90 female with age ranges from 17 to 24 years. Ishihara colorblindness test (numbers made up of color dots) was conducted to screen the color deficient individuals in the same room and in the same light source. Normal people should see 74. Color

deficient people may see D=21. Most color-blind people see normally in all other aspects other than the color of their weakened cone. Color-blind people can usually learn by experience to associate certain colors with different sensations of brightness. Many victims of the defect are unaware that they are color-blind. The Ishihara Test is the most well known color blindness test all around the world. It consists of 38 so called pseudoisochromatic plates, each of them showing either a number or some lines[9]. The test (Fig.3) was conducted to screen the color deficient students in the same room and in the same light source. Ten templates were prepared comprising of six circles. Each circle comprised of a number made up of colored dots as shown in the figure. Each study student was asked to read the number from the colored circles. All other parameters those would affect the study were kept constant for all the students e.g.

- Test was carried out at the same time of the day
- Eye fatigue each personnel was given four seconds to identify the number
- Source of light and the room for study was kept the same for all the students.

Normal vision subjects could identify the numbers. Students those were not able to identify the numbers or read the numbers incorrectly were marked as suspected color vision defects and the test was repeated for them. The data was analyzed and conclusions drawn.

**3.The Ishihara Color Test For Color Blindness**

What did you see?

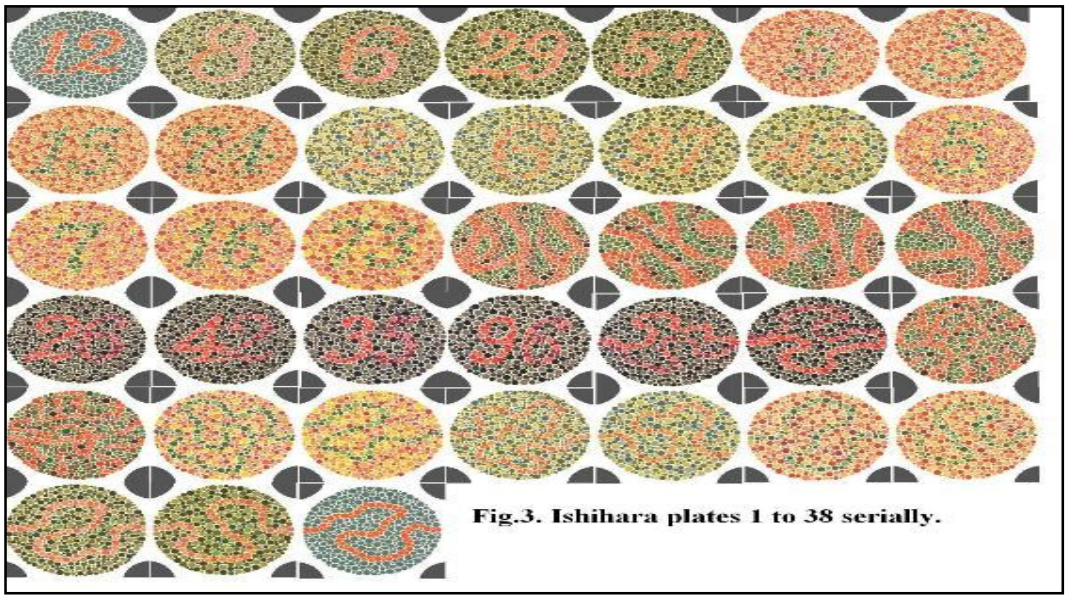


*Figure 3: The Ishihara Color Test for Color Blindness*

**4.Result**

Out of 225 candidates 04 individuals were suspected of color vision defect. Among them male (2.2%) & female (1.1%) were found to be color blind (table 1). All the individuals could differentiate between blue and red spots but all the color deficient subjects couldn't differentiate between green and red spots.

| Sex | No | Normal | | Colour blind | | Deuton type | |
|---|---|---|---|---|---|---|---|
| | | No. | % | No.. | % | No. | % |
| Male | 135 | 132 | 97.78 | 03 | 2.2 | 03 | 2.2 |
| Female | 90 | 89 | 98.89 | 01 | 1.1 | 01 | 1.1 |

*Table 1: Incidence of red-green color blindness among pharmacy students & staff*

**5.Discussion**

Color blindness is one of the common genetic disorders observed. It is a sex linked recessive trait. If a man is a carrier of a defective X-chromosome he will suffer from color blindness. On women the non defective chromosome is in charge & therefore she is not colorblind but a carrier for color blindness. In our study it was found that 2.2% of the males were color blind while 1.1% of the females were color blind. In the study conducted by Al Aqtum, it was found that 0.33% females were color blind: one of them showed protanomalia; 1 protanopia; and 2 deutranopia. In males – 8.72% were color blind: 4 showed protanopia, 8 deuteranomalia and 4 deutanopia. [1] In the another study, it was found that 9.3% of men and none of the women were color blind.[2] The prevalence of color defective vision in male dentists was found to be 8.2% by Mc Maugh,[3] 9.9% by Moser et al[4] and 14% by Barna et al.[5] Previous studies have shown that color defective personnel were found to make significant errors in hue and chroma selection than normal vision people.[6] Observers were more sensitive and critical of crowns where color differed in redness as opposed to crowns whose color differed to the same extent in yellowness.[7]

There are many tests for color blindness eg. Pseudoisochromatic plates like Ishihara test and Dvorine, Bostrom, AO HRR, Farnsworth-Munsell 100 Hue Test which gives a person many colored caps with slight variations of colors, and asks him to sort colors that are very close together. In our test, Ishihara plates were used to screen the individuals. It is not a confirmatory test and it was only used for screening defective vision people who were later advised to refer a specialist for confirmatory diagnosis. Normal people should see 74. Color deficient people may see D=21.People with

red/green deficiency will not be able to see the red/green pattern and will see the 5. People with normal vision will see both the patterns, but since the red/green is stronger than the yellow/blue, the normal person will see the digit 6. The personnel suspected with a color defect can be counseled on other alternate options of shade matching instead of the traditional trained human eye method.

**6.Summary And Conclusions**

Males (2.2%) show color defective vision (CVD) more than females (1.1%) due to its genetic predisposition. Pharmacy students and personnel were screened for color defective vision and referred to the ophthalmologist for more accurate investigations. Alternate means of shade selection/ matching be advised for color defective personnel. Defective color vision students and personnel were advised to take assistance in appointments of shade selection / matching. After experimental evaluation and database used for these projects, it was recommended that during every academic year each staff, supporting staff, students and pharmacy professionals should get screened through Color Blindness Test to avoid accidental cases due to misreading of color of medicines and prescriptions written in red and green ink by doctors.

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