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A STUDY ON COLOUR VISION DEFECTS AMONG GIRLS OF A PARTICULAR AGE GROUP IN CHENNAI

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Abstract: Colour blindness (CVD) is a multifactorial defect recorded worldwide and it has a peculiar pattern of prevalence among different geographical locations and in various ethnic groups. In this study, the prevalence of colour blindness is documented among city girls. Prevalence among the girls of same age group, prevalence among different ethnic groups and prevalence among various marriage preferences of their parents were documented. The prevalence among the girls was 3 in 100. There was significant difference among various ethnic groups. The results were discussed.
Keywords: Colour blindness, ethnic, CVD.

1. INTRODUCTION

Colour blindness is the condition of inability or decreased ability to see or perceive colour differences under normal lighting conditions (Wong 2011). Colour blindness may be a Total colour blindness, Partial colour blindness, Red–green, Dichromacy (protanopia and deuteranopia), Anomalous trichromacy (protanomaly and deuteranomaly), Blue–yellow, Dichromacy (tritanopia), Anomalous trichromacy (tritanomaly), Blue-green trichromacy (tritanomaly). Colour blindness affects a large number of individuals, with protanopia and deuteranopia being the most common types (Wong, 2012). Colour blindness may be due to genetic inheritance, physical or chemical damage to the eye, the optic nerve, or parts of the brain (Adam A., 1969; Adam A., 1986). It can also include the causes like brain or retinal damage caused by Head shaken baby syndrome, accidents and other trauma which produce swelling of the brain in the occipital lobe, and damage to the retina caused by exposure to ultra-violet light (Fishman G.A., 2005). The most common cause is genetical, inherited from mutations on the X-Chromosome (Dutta PC., 1966). But the mapping of the human genome has shown there are many causative mutations—mutations capable of causing colour blindness originate from at least 19 different chromosomes and 56 different genes (as shown online at the Online Mendelian Inheritance in Man (OMIM) database at Johns Hopkins University). Two

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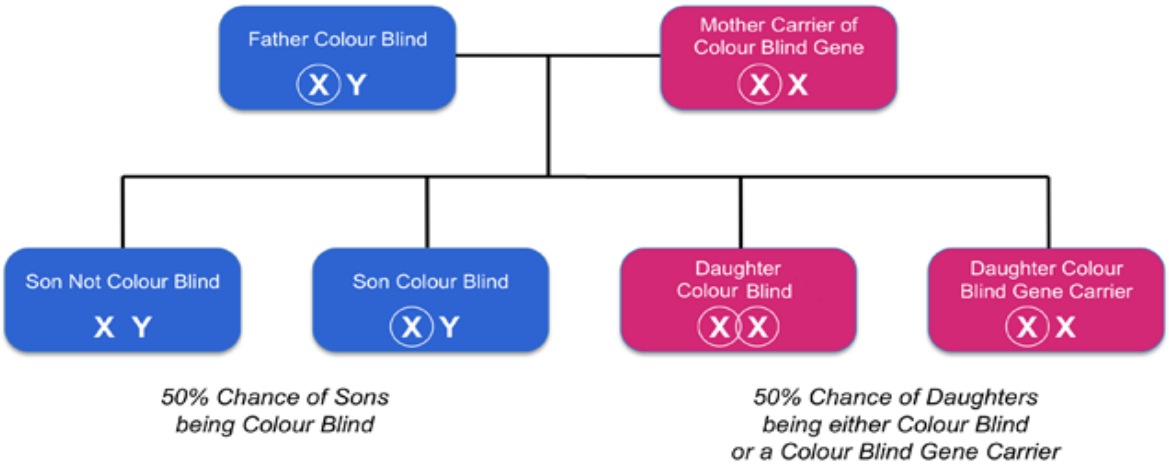
of the most common inherited forms of colour blindness are protanopia, and deuteranopia (Wong, 2012).

Fig-1. Heritability of colour blindness from A colour blind man and a colour blind carrier woman



A colour blind boy can't receive a colour blind 'gene' from his father, even if his father is colour blind , because his father can only pass X chromosome to his daughter.

A colour blind daughter therefore must have a father who is colour blind and a mother who is a carrier (who has also passed the faulty gene to her daughter). If her father is not a colour blind carrier daughter can become a carrier in one of two ways, i.e, she can acquire the gene from a carrier mother (or) from a colour blind father. That is why colour blindness is more common in men than in women.

With this backdrop, the present study was conducted with the following objecctives.

1. To study the prevalence of colour blindness in the age group between 18-20 yrs in girls
2. To study the prevalence of colour blindness in relation with the type of marriage.
3. To study the prevalence of colour blindness in relation to their ethnic group.

2. MATERIALS AND METHODS

The data were collected from college girls of Chennai in age group of 18 to 20. The test consists of a number of colored plates, called Ishihara plates, each of which contain a circle of dots appearing randomized in color and size. The fact that colorblind people can't distinguish colors along the confusion lines is used to build a pattern of differently colored dots. The full test consists of 38 plates with various designs as mentioned below:

Vanishing design: Only people with good color vision can see the sign. Color blind individuals won't see anything.

Transformation design: Color blind individual will see a different sign than people with no color vision defect.

Hidden digit design: Only color blind individual can be able to spot the sign. Individuals with perfect color vision won't be able to see it.

Classification design: This is used to differentiate between red- and green-blind persons. The vanishing design is used on either side of the plate, one side for deutan defects and the other for protans.

The results were grouped and compared according to the objectives.

3. RESULT AND DISCUSSION

Out of 100 girls, 97% were normal 3% were found to be colour blind of any one of the above mentioned types. Various studies reported that highest colour blindness (6.5%) people were from Bombay. Datchayani *et al.* (2006) reported that lowest frequency of colour blindness was reported in Tamil Nadu compared with the other states of India.

As per the reports of Tamil Nadu State Blindness Control Society, functioning under Health & Family Welfare Department of Government of Tamil Nadu, -'of the total estimated 30 million blind persons in the world, 6 million are in India, and the National level prevalence is 14 per 1000. In Tamil Nadu, the prevalence of blindness is 4 per 1000 population'. But in the present study, the frequency of colour blindness is found to be increased (3%) when compared to the data published by Health & Welfare Department, Tamil Nadu.

Table -1. Color Blindness and Type of Marriage

COLOUR BLIND CONDITION	UNRELATED MARRIAGE	CONSANGUINOUS
NORMAL	63 (96.90%)	34 (97%)
ABNORMAL	2 (3.07%)	1 (3%)

The prevalence is 2 in 65 (3.07 percent) among offspring of unrelated parents and 1 in 35 in offspring of consanguineous marriages. Though the prevalence is obviously much higher than the previous report by Family and Welfare Department of Tamil Nadu, there is no statistical difference between the two groups of marriages.

Table-2. Colour Blindness in Ethnic Group Girls

CASTE GROUP	NORMAL	ABNORMAL
BC	40 (95.20%)	2 (4.76%)
MBC	22 (95.65%)	1 (4.34%)
SC/ST	35(100%)	0 (0%)

The prevalence among different ethnic groups were recorded and presented in table 2.

In the present study, the backward and most backward had prevalence of 4.76% and 4.34% respectively and it was 0% in scheduled caste and tribes. The results are in concurrence with the results of previous studies, as reported by Clements, F (1931), Bhasin *et al.* (1994), Bhasin and Walter, (2001) and Shah *et al*. (2013).

4. Conclusion

Being a genetic disorder, the incidence of colour blindness vary from race to race and are therefore different in different geographical regions of the world inhabited by people of different ethnicity. Many of the genes involved in colour vision are on the X chromosome making colour blindness much more common in males than in females because males only have one X chromosome, while females have two. Because this is an X-linked trait, an estimated 2–3% of women have a 4th colour cone and can be considered tetrachromats although it is not clear that this provides an advantage in colour discrimination. Hence, the present study was conducted among girls from various ethnic groups and different parentals. There was no difference in the prevalence based on the type of marriage of their parent, but there was significant difference in ethnicity groups. Further study is required with bigger sample size and molecular level studies are required to justify the results if the results are concurrent.

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