COLOUR VISION TEST AMONG SCIENCE LABORATORY TECHNOLOGISTS IN NASARAWA STATE UNIVERSITY, KEFFI

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Abstract

Color –blindness is the inability to differentiate between some colors that other people can do. Using Ishihara test, the results indicate the prevalence of color vision deficiency in the technological profession. This research aimed to study color blindness prevalence among technologists in the laboratories of Nasarawa State University, Keffi. A cross- sectional descriptive and analytical study was conducted among 45 staff of the laboratories in the school to detect color vision problems using Ishihara Test. The result of the research shows that 10 in 28 men and 1 in 17 women suffer from various forms of defective colour vision. The research revealed that the degree of colour vision disability varies widely with age; it also revealed that the colour vision defects are prevalent in men than in women. But the results showed that there is no significant correlation between color blindness defect and exposure to chemical agents, type of job, history of familial defect and race. We suggest that color blindness as medical conditions should restrict employment choices for laboratory technicians and technologist's job in Nasarawa State University, Keffi.

Keywords**:** *Colour Defects, Colour Vision, Ishihara Test, Achromatopsia, Photophobia.*

INTRODUCTION

Colour vision deficiencies are group of conditions that affect the perception of colour. It causes a range of changes in colour vision, from mild difficulty with distinguishing shades to a total inability to detect colour. These conditions are divided into three major categories: red-green colour vision defects, blue-yellow colour vision defects, and a complete absence of colour vision (Metha, 1992).

Red-green colour vision defects are most common form of colour vision deficiency. Affected individuals have trouble distinguishing shades of red and green. Blue-yellow colour vision defects, which are rare, get problems with differentiating shades of blue and green. These two forms of colour vision deficiency disrupt colour perception but do not affect the sharpness of vision (visual acuity). (Birch, 1998).

An absence of colour vision, called achromatopsia, is uncommon. People with complete achromatopsia cannot perceive any colours. They see black, white, and gray. A milder form of this condition, incomplete achromatopsia, may allow some colour discrimination. People with achromatopsia almost always have additional problems with vision including reduced visual acuity, increased sensitivity to light (photophobia), and small involuntary eye movements called nystagmus.

Colour vision deficiency (CVD) has a high prevalence and is often a handicap in everyday life. Those who have CVD will be better able to adapt and make more informed career choices, if they know about their deficiency. The fact that from 20 to 30 per cent of adults with abnormal colour vision does not know they have CVD suggests that colour vision is not tested as often as it should be (Hardy,1954). This may be because of practitioner uncertainty about which tests to use, how to interpret them and the advice that should be given to patients on the basis of the results.

Testing colour vision (TCV) has made the process of testing for colour vision

deficiencies standardized and more efficient. TCV has transformed the traditional isochromatic colour vision test booklet into an online based colour test that tests for protan, deutan, and tritan colour vision deficiencies.

Approximately 1 in 12 men and 1 in 200 women suffer from some form of defective colour vision. The degree of disability varies widely, and can even be so severe as to preclude an individual from pursuing certain careers. Thus, the importance of this study cannot be over-emphasized.

The objectives of this study is to examine and assess the level of colour perception among the technologists in Nasarawa State University, Keffi. Screening showed that 100% of the color-blind people found are not aware of their anomalous vision status. Thus, screening in the working place would greatly help affected technologist to know how to relate their status with their daily activities.

Defective Colour Vision is the inability or decreased in the ability to see colour, or perceive colour differences, under normal colour lighting conditions. Colour blindness affects a significant percentage of the population. The most usual cause is fault in the development of one or more sets of retinal cones that perceive colour in light and transmit that information to the optic nerve. This type of colour blindness is usually a sex-linked condition. The gene that usually produce pigments are carried on the x-chromosome; if some of these genes are missing or damaged, colour blindness will be expressed in males with a higher probability than in females because males only have one x-chromosome (in females, a functional gene is sufficient to yield the needed photo pigments) (Cole, 1964).

Colour blindness can also be produced by physical or chemical damage to the eye, the optic nerve, or part of the brain. The extent to which individual's colour vision is defective can vary enormously along a scale from mild deficiency to total lack of colour vision (true colour blindness) (Steward, 1989).

Mildly affected individual have difficulty with pale colours and with darker hues, but colours will only be confused if they are of exactly the same brightness. If one receptor type is missing and therefore cannot respond to any wavelength, a severe form of colour vision defect results. Severely affected individuals have difficulty even with bright colours although again, they can differentiate colours if they differ in terms of brightness. (Walls, et al.,1959). Koningsberger (1994), reported that color vision deficiencies were detected in 8% of Dutch gastrointestinal endoscopist affects an endoscopist's diagnostic skill. Using a literature search, the results indicated the prevalence of color vision deficiency (CVD) in the medical profession and it's on medical skills.

Defective colour vision is usually inherited, although it can be acquired as a result of eye disease, or as a side effect of medication or toxic poisoning. Acquired colour vision deficiency is very rare (Crone,1961). Sufferers are frequently blue/yellow defective, which means that they cannot be tested for using some standard procedures such as the Ishahara plates.

The common term is "colour blindness", however this is misleading due to the wide variation in deficiency experienced. The medical terminology appears at first sight to be quite complex and is loosely based on Greek, table 1 gives the example of some of the terminologies used.
Most colour vision problems are inherited (genetic) and are present at birth.
People usually have three types of cone cells in the eye. Each type senses red, green, or blue light. You see colour when your cone cells sense different amounts of these three basic colours. Most cone cells are found in the macula, which is the central part of the retina (Post, 1982).

Inherited colour blindness happens when you don't have one of these types of cone cells or they don't work right. You may not see one of these three basic colours, or you may see a different shade of that colour or a different colour.(Went, 1985).

This type of colour vision problem doesn't change over time.
A colour vision problem isn't always inherited. In some cases, a person can have an acquired colour vision problem. This can be caused by:

- Aging.
- Optic nerve diseases (optic Neuritis)
- Injury to the eye (Cole, 1983).

MATERIALS AND METHODS

The literature on colour vision tests and the relationship between the results of the tests and performance at practical colour tasks was reviewed.

Forty-five members of the technologists with either congenital colour vision deficiencies or normal colour vision, matched for age and gender, were shown to outline 10 photographs of plates with different number inside each plate to be identified. The plate was held at the normal reading distance from the eye while the test is being carried out. They were asked to identify each number in the plates in three (3) seconds. This test was carried out on the internet through "online colour vision test". The test result shows immediately under the plate by clicking the result displaying button.

RESULTS AND DISCUSSION

This study describes the examination of a cross-sectional study in the Laboratories of Nasarawa State University, Keffi where technologist and technicians were examined. The study was expected to show the status of each individual so that the colored blind groups can be highlighted as the people who should be educated on the defect.

The color vision test that was used in this study is the Ishihara. From the results obtained, approximately 10 in 28 men and 1 in 17 women suffer from some form of defective color vision. There is significant correlation between color blindness defect and their sex and age. However, the results are less than the reports of prevalence of color blindness from United Kingdom. But it would be a wide range of difficulties by color-blinded technologist to perform an error free practical to his students. Visual impairment has a profound impact on society. The degree of disability varies widely and can even be severe as to preclude an individual from pursuing certain careers. Complete "colour-blindness" (i.e. the perception of the world in monochromes shades of grey), however is very rare.

It was determined that 13% of histopathologist and 10% of medical laboratory technologists in the United Kingdom have deficient color vision which make more errors in slide interpretation than those with normal color vision. They concluded histopathologists and medical laboratory technologists and technicians should have their color vision tested (Poole, et al., 1997a, 2009b). However, our research results are less than the reports of prevalence of color-blindness from United Kingdom. Finally, laboratory scientist should be tested for color vision defects before employment.

Table 1. Types of Colour Defect

Terminology	RED	BLUE	GREEN
Trichromatism (Normal Sight)	Can differentiate all colours		
Anomalous Trichromatism	Can differentiate all colours but one colour has reduced or displace sensitivity		
Protanomaly	Displaced sensitivity		
Dueteranomaly			Displaced sensitivity – most common colour vision defect
Tritanomaly		Displaced sensitivity	
Dichromatism			
Tritanopia	Receptor Normal	Receptor Missing	Receptor Normal
Deuteranopia	Receptor Normal	Receptor Normal	Receptor missing
Protanope	Receptor missing	Receptor normal	Receptor normal
Monochromatism (Achromatopsia)	Totally unable to differentiate colours of equal brightness		

CONCLUSION

Within the limit of experimental error, it was observed that colour vision defect is prevalence among the males than the females, which go with the ages of the individuals.

All people with abnormal colour vision, even those with a very mild deficiency, have some degree of impairment of their ability to see coloured objects in natural surroundings.

Technologists should from time to time conduct a colour blindness test using the Ishihara Test. This test can be relied on to provide sufficient information to enable patients to be told the type of colour vision deficiency, CVD they have and whether it is mild or moderate-to-severe**.**

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Table 2. Results of Colour Vision Test among Technologists.

S/N	AGE	GENDER	STATUS	
1	25	M	Trichromatism (Normal Sight)	
2	25	M	Trichromatism (Normal Sight)	
3	25	M	Trichromatism (Normal Sight)	
4	26	F	Trichromatism (Normal Sight)	
5	26	F	Trichromatism (Normal Sight)	
6	27	M	Trichromatism (Normal Sight)	
7	28	M	Trichromatism (Normal Sight)	
8	29	M	Trichromatism (Normal Sight)	
9	31	M	Trichromatism (Normal Sight)	
10	32	F	Trichromatism (Normal Sight)	
11	34	M	Trichromatism (Normal Sight)	
12	34	F	Trichromatism (Normal Sight)	
13	35	M	Trichromatism (Normal Sight)	
14	35	F	Trichromatism (Normal Sight)	
15	35	M	Trichromatism (Normal Sight)	
16	36	M	Trichromatism (Normal Sight)	
17	36	F	Trichromatism (Normal Sight)	
18	37	M	Trichromatism (Normal Sight)	
19	37	F	Trichromatism (Normal Sight)	
20	38	M		Anomalous Trichromatism
21	38	F	Trichromatism (Normal Sight)	
22	40	M	Trichromatism (Normal Sight)	
23	41	F	Trichromatism (Normal Sight)	
24	41	M		Anomalous Trichromatism
25	42	F	Trichromatism (Normal Sight)	
26	42	M		Anomalous Trichromatism
27	43	F	Trichromatism (Normal Sight)	
28	44	F	Trichromatism (Normal Sight)	
29	45	M	Trichromatism (Normal Sight)	
30	46	M	Trichromatism (Normal Sight)	
31	47	M	Trichromatism (Normal Sight)	
32	48	M	Trichromatism (Normal Sight)	
33	48	F	Trichromatism (Normal Sight)	
34	52	F	Trichromatism (Normal Sight)	
35	53	M	Trichromatism (Normal Sight)	
36	55	F	Trichromatism (Normal Sight)	
37	58	M		Anomalous Trichromatism
38	58	F	Trichromatism (Normal Sight)	
39	60	M		Anomalous Trichromatism
40	62	M		Anomalous Trichromatism
41	63	F		Anomalous Trichromatism
42	64	M		Anomalous Trichromatism
43	64	M		Anomalous Trichromatism
44	65	M		Anomalous Trichromatism
45	65	M		Anomalous Trichromatism