Original Article

Frequency of Color Blindness in Pre-Employment Screening among Recruits for Defense Persons in Geewan Recruiting Centre, Kuwait

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Abstract

Background: Color blindness or Color Vision Deficiency (CVD) is X-linked recessive disorder characterized by a decreased ability to perceive the difference between colors.

Objective: To determine the prevalence rate of color blindness among candidates for new police and military recruits in Kuwait.

Methods: A cross-sectional descriptive review of the medical records of 10,000 young male adults (Kuwait has only males in their uniformed officials) who were screened and examined for police and military service between December 2021 and August 2022 was conducted. Ishihara color test plates were used to diagnose color blindness among participants. The findings were divided into two groups. Data were tabulated, and statistically analyzed. The prevalence of color blindness among the new candidates was determined.

Results: A total of 10,000 young male adults (As no Uniformed Female is allowed in Kuwait Army) were examined. Among the studied sample, 370(3.7%) out of 10000 were unfit for defense service due to color blindness, with a mean age of 21.7±3.9 years (range 17-26 years). The prevalence of blindness was found to be 3.7% (2.5-4.9).

Conclusion: The prevalence of color blindness among male young recruits was almost the same compared with other studies in neighboring countries and around the world.

Keywords: Color vision deficiency, Pre-employment screening, Cross-sectional study, Defense services.

Introduction

Color blindness is the inability to perceive color differences under normal lighting conditions. It is most commonly inherited from mutations and rearrangements of the genes of three classes of cone pigments on the X chromosome and is thus more common in men than women. The Trichromatic Theory of color vision is based on the unequal stimulation of the short (S), medium (M) and long (L) wavelength-sensitive cones. Deuteranopia (green blindness) arises from the absence of photopigments in the M cone and protanopia) is to a due the the L (red blindness) cone. Few prevalence studies have been reported from other parts of the world such as Turkey (7.3%)[1], Iran (4.7%)[2], Saudi Arabia (2.93%)[3] etc. However, the prevalence of deficiency in European Caucasians is about 8% in men and about 0.4% in women, and between 4% and 6.5% in men of Chinese and Japanese ethnicity.[4] Although color blindness does not cause any significant disability, it does keep one from performing certain jobs or causes hindrance in some ways. During employment in some jobs, such as healthcare or defense service CVD is acknowledged as an obstruction in adults. Color vision standards are established in aviation and defense services, railway fields and for drivers of motor vehicles. However, they have not been effectively adopted. We are observing an increasing number of pre-employment examination cases being referred from general practitioners to the ophthalmologist. The objective of this study was to assess the prevalence of color vision impairment among Kuwaiti young adults presenting for pre-employment health screening in a recruiting center.

Materials and Methods

A verbal informed consent was taken from all candidates coming for ophthalmic examination. This was a cross-sectional study. The study included all individuals (Kuwait is an only male based Armed Forces) who had applied for jobs as a recruit for Kuwait Defense forces in the Geewan Recruiting Center and had undergone a pre-employment eye examination during December 2021 to August 2022. The exclusion criteria were to exclude one individuals who had history of central nervous system disease or anti-tuberculosis drugs and ocular or neurological surgeries. Fortunately, no individual met the criteria. It was non probability consecutive sampling. The color vision deficiency was determined using the 24-plate Ishihara's Test of Color Vision.[5] The color vision testing plates are held at 75cm from the person and tilted at a right angle to the line of vision. The test was done in a properly lit room resembling the effect of natural daylight. The person was asked to read the numbers seen on the test plates, ranging from 1 to 17, within 5 seconds for each plate. Assessment of the reading of plates 1–15 determines the normality or defectiveness of color vision. If 13 or more plates are read correctly, the color vision is regarded as normal. If only 9 or less than 9 plates are correctly read, the color vision is regarded as being "red-green'' deficient. The plates 16 and 17 are used to differentiate between protan and deuteran types of color vision deficiency. The categorization of color vision defects was studied

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with the aid of the road-like color lines (plates 18 to 24) postulated in the chart. The persons who read all the plates properly were considered normal, whereas the one who could not read the plates accurately was considered to be color vision deficient. This is the most commonly used screening test for color deficiency. Two medical assistants collected data on the candidate's age, gender, and color vision deficiency using a structured proforma.

Results

A total of 10,000 people underwent pre-employment screening from December 2021 to August 2022. Out of these 10,000 people, the mean age of the candidates was 21.7 (±3.9) years. Overall, 3.7% (370 out of 10,000) of people had poor color vision (Table-I). Color blindness was present in 1 in 27 men (3.7%).

Table-I: Frequency of color blindness by age group.

Age group	Screened	Frequency of Individual with Color vision deficiency	Percentage of Individual Color Vision Deficiency
17-21 years	6543	245	3.74%
22-26 years	3457	125	3.53%

Table-II: Frequency of Red (P)- Green(D)- Brown(unclassified) color blindness.

Specific Color Blindness	Frequency of Individual with Color Vision Deficiency	Percentage of Individual with Color Vision Deficiency
Deuteranopia	225	2.25%
Protanopia	50	0.5%
Unclassified	95	0.95%

Discussion

Color vision deficiency, though not very rare, remains an unnoticed problem most of the time. Color blindness, commonly used in daily practice, is a misnomer. To our best knowledge, we have not come across any person who is totally colorblind, i.e. one should appreciate everything in life as black and white only. Instead, all the persons diagnosed as having 'total color blindness' by the Ishihara Chart could identify the primary colors correctly when shown each color individually. It is well known that people who are deficient in color vision adapt to their deficiency by using cues. In a population-based cohort study, Cumberland found congenital color defects confer no functional disadvantages in relation to educational attainment or unintentional injury, thus challenging the rationale for screening.[6] It is generally accepted that color vision deficient adults can drive safely because they can identify a stop sign by its shape and determine which traffic light means 'go' and which one means 'stop' because they are always in the same order on traffic lights. However, technological changes (e.g., lower cost of color printing, wide use of color computer monitors) present additional problems for those with this deficiency;[7] the problem faced by these people merely a minor one. Therefore, knowing of their deficiency at a much earlier age will allow them to adapt a profession with a low need for color vision. In day-to-day activities, color vision deficiency can be difficult to detect. Defense personnel with color deficiencies experience difficulties in identifying changes in colorful wires, chasing a criminal, during war, or in the medical profession. This compromises the citizen's safety. These difficulties are under-reported due to lack of screening before selecting or starting the profession in defense or health care. Pre-employment eye screening is important avenue to identify individuals with such deficiencies. In addition to Ishihara color vision test plates, other methods such as the Naegel Anamaloscope test and the Franseworth-Munsell hundred hue test are also available to test for color vision. These two tests are more sensitive and accurate but also time-consuming; thus, they are not suitable for mass screening.[8] The Ishihara test charts were chosen in this study because they are easier and quicker to perform; familiarization with all the colors is not necessary since the answer given is in terms of numbers. Few prevalence studies have been reported from other parts of the world, such as Turkey (7.3%)[1], Iran (4.7%)[2], Saudi Arabia (2.9%)[3] but no study has been found in Kuwait till today. We are observing an increasing number of pre-employment examination cases being referred from general practitioners to the ophthalmology outpatient clinic for assessment of color vision deficit and medical fitness. In this study, we determined the prevalence of color blindness among candidates for Kuwait's defense forces. The overall prevalence of color vision deficiency was 3.7% in this study. A total of 10,000 people underwent pre-employment screening from December 2021 to August 2022. Out of these, the mean age of candidates was 21.7(±3.9) SD years (range 17–26 years). Overall, 3.7% (370 out of 10000) persons had color vision deficiency (Table-I), of whom 51% are 17–25 years old and 49% are between 22–26 years old. Color blindness was present in 1 in 27 men. From the total population, 2.25% are green colorblind, 0.5% are red blind and 0.95% are unclassified (especially brown color defects) (Table-II).

Conclusion

The study shows prevalence of color blindness in young male adults applied for Kuwait Defense Service are almost same as like as the neighboring countries. With early detection of colorblindness by screening can help a person for selecting different profession with a low need for color vision. Frequent screening campaign should be included in preschool and school going children for early detection of color blindness to help them to find out a suitable job in future life.

References

1. Citirik M, Acaroglu G, Batman C, Zilelloglu O. Congenital color blindness in young Turkish men. Ophthalmic Epidemiol. 2005; 12(2):133–7.

2. Rez aei L et al. J Ophthalmic Vis. Res 2022. Prevalence of Color Blindness in Iranian Students: A Meta-analysis 2022; 17(3):413-23.

3. Ebi Eposuobeni, Ophthalmic Epidemiol Dec 1996. Prevalence of congenital red-green color vision defects in Arab boys from Riyadh, Saudi Arabia Pub. 2009:167–70.

4. Birch J. Worldwide prevalence of red-green color deficiency. J Opt Soc Am A Opt Image Sci Vis. 2012; 29(3):313–20.

5. Ishihara S. Tokyo, Japan: Kanchara & Co Ltd; 1998. The series of plates designed as a test for color deficiency, 24 plate edition:1–9.

6. Cumberland P, Rahi JS, and Peckham CS. Impact of congenital color vision deficiency on education and unintentional injuries: findings from the 1958 British birth cohort. BMJ. 2004; 329:1074–5.

7. Ebi Eposuobeni, Ophthalmic Epidemiol Dec 1996. Prevalence of congenital red-green color vision defects in Arab boys from Riyadh, Saudi Arabia Pub. 2009:167–170.

8. Newell FW. 8th St. Louis Mosby-Year Book, Inc. Ophthalmology: Principles and Concepts. 1996:157.