

# Color Vision Defects among Textile Mill Workers in Lahore

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## ABSTRACT

**Purpose:** To find out the color vision defects among textile mill workers in Lahore.

**Study Design:** Descriptive cross sectional study.

**Place and Duration of Study:** University of Lahore from June 2019 to December 2019.

**Methods:** Study was done at different textile mills in Lahore, Pakistan. Self-designed proforma was used to record data including age, gender, occupation, any medication or surgery. The workers with best corrected visual acuity of 6/6 and refractive error less than 3.00 D of sphere or astigmatism less than 1 D of cylinder with no history of ocular surgeries were included in the study. Color vision was assessed binocularly with the best correction in a trial frame using Ishihara Isochromatic color plates (38 plates) held at about 40 cm from the worker. Examination of the anterior segment and posterior segment was done by using slit lamp Biomicroscopy and 90 D of condensing lens. Data was entered and analyzed using the SPSS version 22.

**Results:** During this study 1,250 textile mill workers fulfilled the inclusion criteria. There were six hundred and fifty males and 600 females who had an assessment of their colour vision. Only 10 workers were found to be suffering from color vision deficiency, which was 0.8% of the total sample size. All of the color vision deficiency patients were male of different age group.

**Conclusion:** Colour vision defects were found in small percentage of textile mill workers as there is no proper color vision examination in pre-employment examination at public and private textile industry.

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## INTRODUCTION

The Human eye has unique characteristics of having trichromatic vision and capability to differentiate between dissimilar wavelengths of light. This is because of three unique types of retinal cones which function to detect the colors. According to certain theories, there are red green and blue cones

with specific pigments. The functions of these cones are to detect an appropriate mixture of red, green and blue lights, which enables the eye to match any color which is visible to it. When this normal trichromatic vision is absent in a person he or she is labeled as having abnormal color vision, color vision deficiency or simply color blind.<sup>1</sup>

The X linked red green deficiency affects approximately 8% of male population and 0.4% of females in most of the western countries.<sup>2</sup> Color vision deficiency has been reported in different parts of the world and the prevalence in different countries is nearly close to one another. Color Vision Deficiency is found in 4.7% of Irani population.<sup>3</sup> In United Kingdom the prevalence is 6.7%, 8.5% in

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Mediterranean Croatia and 8.9% in Croatia.<sup>3</sup> The rate of dichromacy was higher in Mediterranean Croatia (2.40%), while the rate of anomalous trichromacy was greater in inland Croatia (6.93%).<sup>4</sup> A higher number of color vision deficiency is found in Australia and Turkey which is 7.4% and 7.3% respectively.<sup>5</sup> However, color vision deficiency in Saudia Arabia and Pakistan are 2.90% and 2.75% respectively.<sup>6</sup>

Color vision deficiency in all over the world is taken as an occupational hazard as it is creating hazardous troubles in daily life activities. Most of the patients having color vision deficiency are unaware of their deficiency which results in various mishaps.<sup>7</sup> The problems these persons face include career selection (33%), disability in job (25%), traffic signal recognition (13%) and judgment in daily routines (75%).<sup>8</sup> According to a study in UK, some medical practitioners were unable to detect red blood or rash in a given photograph and they had no idea of having color vision deficiency.<sup>2</sup> Color vision patient have difficulty in conducting daily routine activities. Most of the patients are unaware of their condition which lead them to many handicaps.<sup>6</sup>

The Purpose of the study was to find out the frequency of colour vision deficiency in textile mill workers in Lahore region.

## METHODS

The study was a cross sectional descriptive study, with non probability convenient sampling technique. It was done at different textile mills in Lahore, Pakistan. The principles outlined in the Declaration of Helsinki (2008) were followed for the conduction of study and a formal approval from the ethical review committee was obtained for the conduction of study. With informed consent, the data was collected among workers working at different textile mills in Lahore. Proforma was designed which was used to take history of the workers and other parameters including age, gender, occupation, any medication or surgery. Visual acuity was measured using Snellen chart. The workers with best corrected visual acuity of 6/6 after refraction and a refractive error of less than 3.00 D of sphere or astigmatism less than 1 D of cylinder, with no history of ocular surgeries or pathologies, age between 20 – 40 years were included in the study. Examination of the anterior segment and posterior segment was done by using slit lamp Biomicroscopy and 90 D condensing lens. Color vision was assessed

binocularly with the best correction in a trial frame using Ishihara Isochromatic color plates (38 plates). The color vision plates were held at about 40 cm from the worker. Each Ishihara plate was shown to the patient for 10 seconds and they were asked to read the numbers and patterns shown on the plate. The response was compared with chart key and color vision deficiency was screened out. Data was entered and analyzed using the SPSS version 22.

## RESULTS

During the study 1,250 textile mill workers fulfilled the inclusion criteria and among them 650 were males and 600 were females. Among sample size of 1,250 only 10 workers were suffering from color vision deficiency, which was 0.8% of the total sample size. All of the color vision deficiency patients were males of different age groups.

## DISCUSSION

Color vision Deficiency is a genetic disorder. Different studies have been conducted for the treatment of color vision deficiency. A study based on laboratory experiments showed that monocular filters could improve color discrimination in dichromats.<sup>9</sup> Formankiewicz and Mollon conducted a study and predicted that deutrope may be helped by monocular long band lens to discriminate color along deutan axis (colours of equal luminance that lie along a deutan axis in colour space look indistinguishable to a deuteranopic observer).<sup>10</sup> Color Vision defects can be treated by gene therapy. Different studies have been conducted on mice and they suggested different reasons for color blindness. A study revealed that adeno-associated virus can act as a transmission vector in rod monochromacy.<sup>11</sup> Improvement of cone function was observed both electrophysiologically and behaviourally in almost all treated animals. However, the reason remained unclear as to in which stage the improvement of vision can be achieved during developmental stages. Alteration was observed in inner retinal structure, photoreceptor mosaic and in re-organization of the visual cortex.<sup>12,13,14</sup> The studies showed that these changes alone would have an impact on visual function.

Textile mills are working as a backbone in the economical sector of a country. Pakistan's textile industry is the 8<sup>th</sup> largest exporter of the textile

products in Asia. It provides more than 60 percent to the total country's exports and support 8.5 percent of Country GDP.<sup>15,16</sup> Our study showed that 0.8% of the textile mill workers are suffering from Color Vision Defects and the patients are unaware of this deficiency. Textile mills are totally dependent on color vision. A study was conducted in United Kingdom in which colour vision assessment was conducted among different professionals.<sup>7</sup> They observed that no Color Vision Defect was found in textile mill workers because they have a proper colour vision screening protocol during hiring.

Color vision deficiency is the among the largest problems which leads to results in various industrial mishaps.<sup>7</sup> The patients are unaware of this deficiency and this leads to problems in textile works. In Pakistan different professionals are totally unaware of this disease. In United Kingdom, this defect was found in medical practitioners and they were unable to detect red blood or rash in a photograph given to them and they were even having no idea of being color vision deficient.<sup>2</sup> A comparison of color vision deficiency was done among medical and non-medical students, students of Baqai medical University, Karachi were compared with Nadirshaw Edulji Dinshaw University of Engineering and technology and the results showed there was no significant difference ( $p = 0.125$ ) in color vision defects between medical students and non medical students.<sup>6</sup> Colour vision deficiency was found in 3.7% of 1<sup>st</sup> year MBBS students of different Medical Colleges at Faisalabad.<sup>17</sup> In railway lines, 1.3% of employees had color vision defect.<sup>18</sup> A study conducted at Combined Military Hospital (CMH) Bahawalpur, included all individuals who applied for medical fitness examination at Eye department. Color vision deficiency was 3.1% and among them 93.54% were unaware that they had Color Vision Deficiency.<sup>19</sup> The results of our study were similar to the study done at Agha Khan University Hospitals Karachi, where Colour Vision Deficiency was 0.9% among tertiary health care workers.<sup>20</sup> These studies showed that Color vision defects are found in all groups; whether they are students, professional, or uneducated and most of them are unaware of their condition.

## CONCLUSION

Although textile industry is based on colors, there is no proper color vision examination in our textile sector. Colour vision deficiency awareness should be increased so that everyone in the community is well

aware of it. The test of color vision must be made compulsory in pre-employment examination at public and private sector at every Level.

## Ethical Approval

The study was approved by the Institutional review board/Ethical review board.

## Conflict of Interest

Authors declared no conflict of interest.

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### Authors' Designation and Contribution

Qazi Muhammad Omair; Academic Coordinator: *Concepts, Statistical Analysis, Manuscript Preparation.*

Hifza Imtiaz; Research Coordinator: *Design, Literature Research, Manuscript Editing.*

Maryam Iqbal; Senior Lecturer: *Data Acquisition, Data Analysis, Manuscript Review.*

