EVALUATION OF VISUAL ACUITY IN WORKERS OF TEXTILE INDUSTRY

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ABSTRACT

OBJECTIVE: *To evaluate visual functions and magnitude of visual problems due to work related conditions in textile industry.*

METHOD: *A cross sectional survey was conducted on 93 subjects who were working in the textile industry of Lahore. All the visual functions were assessed. Visual acuity was measured with Log MAR chart, color vision by Ishihara plates, visual field by confrontation test, contrast sensitivity by Lea number plates and glare by targeted lights. Workers of all the age group were included in this study. Consent of subjects was taken and self-designed questionnaire were filled by the workers.*

RESULTS: *Out of 93 subjects, 10% were male and 90% female (age between 15-45 years). Maximum visual acuity was recorded in 56(61%) subjects. 43(46.2%) workers were having myopia, respectively. Glare sensitivity was present in 22(24%) participants. Color vision showed that 4(4.3%) had severe color vision deficiency. Contrast sensitivity was deficient in 14(15.2%) participant. 94.6% subjects were working in bright light, 4.3% in normal light and 1.1 in dim light. 5(5.4%) subjects had visual threatening ocular diseases out of which 3.2% had cataract and 2.2% had diabetic retinopathy. All the workers were provided with protective devices by their industry.*

CONCLUSION: *This study concludes that all the visual functions are affected in textile industry workers except visual field. Refractive error was more common among them. Cataract and diabetic retinopathy were present in subjects above 35 years. Ocular injuries were under control because of using protective devices.*

KEY WORDS: *Visual functions, Cataract, Ocular injuries.*

INTRODUCTION

Over 60 million people worldwide are employed in the clothing or textile industry. Recent studies show that chronic lung diseases are more common in workers of industry. Workers have early exposure to the dust and cotton hemp which have long term effect on their respiratory system leading to asthma and chronic obstructive pulmonary disease. The percentage of non-smoker who is exposed to obstructive lung disease is 25-45%. Work exposure to dust is also major report, with risk of 9%.[1]

Millions of workers are working in textile industry. Different types of carcinogenic dyes are used in textile industry. Solvent used in these industries are also connected with different health disorder including cancer. In textile and iron industries, genotoxicity and death related to cancer observed. Workers of textile industries are at higher possibility of developing cancer as they use chemical of different types, are toxic and cause severe health issues. The chemical used in industry include solvent, dyes, finishing agent and synthetic fiber dusts which affect their health. Many studies show the presence of different kinds of cancer including bladder cancer in dyes and bleechers.[2]

While working for long time without taking rest will lead to serious health issues among workers. Workers who performed high physical task are at

risk of developing musculoskeletal disorder, long term sickness, cardiovascular disorder and impaired work ability. Most of the workers with constant work are like to develop nutrients, physical and mental health problems. Most common ocular problems are photophobia, asthenopia, dry eye and uncorrected refractive error. Health problems are gynecological disorder, respiratory problems, gastrointestinal diseases, cardiovascular diseases, nutritional problem, neurological and musculoskeletal problem.[3]

We define visual function to describe how well the visual system works and how well the eye works; functional vision is the term used to describe how well person work in vision related activities. The methods we use to access the visual functions include visual acuity, glare, contrast sensitivity, color sensitivity and visual field. Anomalies in visual functions are decreases of vision, changed color vision, central and peripheral visual field defect and electrophysiological changes.[4]

Visual acuity is defined as the measurement of the ability to resolve the spatial objects. The first step is the management and treatment of visual problems in visual acuity. We use Snellen, Log MAR, Lea symbol and E chart for the testing of vision but most commonly used chart is Snellen as it is available in different languages.[5]

Quality of vision is the key factor and basic parameter of visual acuity. Modern Population-based studies shows that most common cause of low vision and impaired vision in refractive error.[6] Causes of refractive error include reduced flexibility of lens and irregularities in shape of cornea and eyeball. High refractive error will lead to myopia and low will lead to hyperopia. We usually correct them by optical means include eye glasses, contact lens and surgery.

Presbyopia mainly occurs in old age due to change in elasticity of lens. Our goal is to recover the remaining vision for near task.[7]Visual acuity should be same for near and distance, However in amblyopic eye visual acuity is different at near as compared to visual acuity at distance.[8]

Visual acuity is measured under the high contrast. Diseases affect the optic nerve pathway and central region of retina are likely to cause the diminishment of visual acuity. Distance visual acuity is measured by Snellen at 6m and near visual acuity is by hand held chart at distance of 40cm. Contrast sensitivity is the visual ability to differentiate the object from its background in various color, size and brightness. When the image of varying size and brightness enter the pupil in the form of light wave, the cells in the retina begin to make the sense and send the message to brain and interpreted in front of us.[9] Earliest role of contrast sensitivity was to predict the screening of Glaucoma; Second major role is the clinical management of patient.[10]

Contrast sensitivity measurement is the primary method to elevate the functional vision. Standard visual acuity is measured with high contrast conditions. Contrast sensitivity does not provide information about various daily living activities like reading in low light, driving at night. Visual acuity alone cannot assess the patient vision.[11]

Third component if visual function is color vision. Color vision is ability of eye to perceive difference between the light of different wavelength. A person with normal color vision can perceive up to 1 million different shades of light. Color plays an important role in our memory. Color vision develop sharp memory for wide range of objects and learning between visual structure present in the environment.[12]

Color blindness occurs when you are unable to see objects in normal way. It is also known as color deficiency and is commonest disorder especially in males. Color vision deficiencies varies from race to race and geographical areas. Most of the color deficiencies remain undetected due to not having proper screening.

of Ophthalmology and Allied Vision Sciences (COAVS). Research was conducted at COAVS/ Department of Ophthalmology, King Edward Medical University (KEMU) Lahore, from October to December, 2019. Different charts were used to find visual functions. Non-parametric evaluation like gender was compared and analyzed by ANOVA while quantitative variables like age, visual acuity, color sensitivity, contrast sensitivity, glare and visual field were analyzed by mean and standard deviation. All data was entered and analyzed using statistical package for social sciences (SPSS20.00).

RESULTS

Table - 1: Refractive Status

	Frequency	Percent
Myopia	43	46.2
Hypermetropia	2	2.2
Presbyopia	10	10.8
Astigmatism	15	16.2
Any other	13	13.9
None	10	10.8
Total		100.0

Table -2: Kind of Injury

	Frequency	Percent
None	76	81.7
Physical	14	15.1
Chemical	2	2.2
Electrical	1	1.1
Total	93	100.0

Out of 93 subjects, 10% were male and 90% female (age between 15-45years). Maximum visual acuity was recorded in 56(61%) subjects. Myopia was more common in adult's workers. Glare sensitivity was present in 22(24%) participants. Color vision showed that 4(4.3%) had severe color vision deficiency. Contrast sensitivity was deficient in 14(15.2%) participants. 94.6% were working in bright light, 4.3% in normal light and 1.1in dim light. Bright light may cause eye strain, photophobia and asthenopia. Cataract and diabetic retinopathy was found in workers aged above 35 and was referred to Mayo Hospital for further examination. All the workers were having dry eye problem and most of them have ocular injury issues they were advised to consult a doctor. Myopia and hyperopic patients were prescribed to use spectacles. All the workers were provided with protective devices by their industry.

DISCUSSION

This study was conducted to evaluate the visual assessment in workers of textile industry. As far as we know this is the first study that addressed all the visual functions in textile industry workers of Pakistan, and few studies have examined more than one factor. The main objective was to access all visual functions, to find the frequency of ocular injuries and vision problems in workers of textile industry of Lahore. We define visual function to describe how well the visual system works and how well the eye works; functional vision is the term used to describe how well person work in vision related activities. The methods we use to access the visual functions include visual acuity, glare, contrast sensitivity, color sensitivity and visual field. Anomalies in visual functions are decreases of vision, changed color vision, central and peripheral visual field defect and electrophysiological changes.[4]

In previous studies, evaluation of visual functions in workers unprotected to biological solvent in petrochemical industry showed the visual acuity was >0.01 on Log MAR in the case and control groups. The contrast sensitivity among workers was 12cpd. In color vision mean difference was 0.11±0.05. In visual fields the mean difference was -0.31±0.3 dB. Color vision and contrast sensitivity were most affected among workers in petrochemical industry.[25]

Visual function plays an important role in determining the quality of life. Community based analysis evaluate, the problem with low distance visual acuity in elderly community, especially in people living in nursing homes and in women. Visual acuity was measured in 1362 national diet and nutritional survey participants, who was not mentally impaired. Visual impairment using the low vision methodology was measured in 195

Deficiencies can be acquired and congenital. Inherited defects are incurable, non pathological and will go throughout life. It is X-linked recessive disorder and affect as many of 0.5% of females and 8% of males. While acquired deficiency is related to ocular neurological and some metabolic disorder such as certain solvent exposure and drugs toxicity.[13]

Glare sensitivity is defined as, difficulty in seeing in bright light, either direct or reflected. When the reflected light enters the eye, not all the light enter in the retina some is dispersed and produces an annoying phenomena.[14]Complain of glare is mostly present in the cataract patients, for example from car headlights while driving at night and from sunlight. People find glare as more irritating than decrease in visual acuity.[15]

Visual symptoms caused by many pathological factors like, demyelination, axonal degeneration in afferent visual pathway and inflammation.[16] For example in Parkinson disease, patient have a number of visual function disorder. These disorder include change in contrast sensitivity and color vision and they also have difficulty in complex visual task such as emotion recognition and mental rotation.[17]

In the test of glare disability, the subject is required to perform the visual task in the presence of light source. Visual field refers to the area to which an object can see clearly in the periphery and can focus to the central point. The normal visual field range is 50 superiorly, 60 nasally, 70 inferiorly and 90 temporally while central is 30. Visual field examination is one of the most significant parts of the visual functions estimation. There are many methods available to access the visual field loss, type of the method depend on the patient health, age, ability to concentrate and visual acuity. To access the central vision Amsler grid is used while to access the full field Goldmann perimeter, automated perimetry, tangent screen and confrontation test is used.[18]

Visual field defects are direct connected to the pathological changes in the optic nerve head and optic nerve.[19] Other factors are pathological, functional and biological which are related to auto regulation at disc and microcirculation.[20] Textile industry is the largest mass production unit of Pakistan. Textile sector contributes 8.5% of the gross domestic products of Pakistan. Textile products contribute about 60% of Pakistan's export. Towel, yarn, cotton, fabric, knitwear, ready to wear garments etc. are produced at large scale in industrial sector as well as in small scale cottage industry.

Ophthalmic disorder in industrial workers can cause reduced manpower, visual loss, excessive near work cause convergence insufficiency, ocular injuries due to chemical and other ocular diseases. Some of these disorders are preventable by taking some cautionary measurements.[21]

Many industries use the dangerous chemical like mercury, lead and arsenic. These are very harmful that affect the worker's health as well as deteriorate the manpower, damage the brain and eye.[22] Globally, more than 1.6 million people are blind because of injuries. 3 million people fall in the category of low vision.[23] More than 10 million disabilities are because of the industrial ocular injuries.[24]

In industrial sector mostly injuries and ocular health disorder occur due to lack of knowledge. The workers are usually not well educated and are not provided with protective measure to save themselves from ocular injuries.

MATERIALS AND METHODS

The study was a cross sectional survey in which data was collected by self-designed questionnaire and clinical examination. Questionnaire was filled according to patients complain and history of ocular problems and injuries. Informed consent was first obtained from all workers who participated in this research. The research protocol was approved by Ethical review board of College

subjects. Impaired vision was more common in subjects living in nursing home and in women. 132 subjects had undergoes with cataract surgery while 157 were told that they are in the initial stage of developing cataract. Vision was improved by using pin hole in 289 subjects.[26]

According to previous studies, color and contrast were most affected in industrial workers. This study was conducted to evaluate the visual functions in textile industry workers due to their excessive near work of 8 hours and to find visual problems in them. Refractive error and ocular injuries was the most significant finding. This refractive error was slightly greater than that found in petrochemical industry. Myopia was most prevalent refractive error, contrast and color vision was not much affected. The subsequent results were found.

Visual acuity were tested on Log MAR chart and converted into standard Snellen units. (61%) visual acuity was recorded in 56 subjects. Pin hole visual acuity was also examined on all subjects, (89%) as maximum recorded. Near visual acuity ware ranged from N6-N24, N6 was those subjects who did not had vision problem at near. This visual acuity analysis shows that workers were more prone to myopia with (46.2%) in 43 subjects, Hypermetropia was less common, presbyopia in 10(10.8%) and astigmatism in 15(16.2) subjects. Glare sensitivity was checked by targeting light in subject's eye and was present in 22(24%) participants. Visual acuity before and after exposure to light also assessed, which demonstrate that visual acuity was changed after light introduction due to glare sensitivity. Color vision was tested through Ishihara color plates which showed that 4(4.3%) had sever color vision deficiency, 3(3.2%) with mild defect in color vision while 83(89.2%) showed no defect in color vision. Contrast sensitivity was tested with Lea number plates showed that contrast was deficient in 14(15.2%) subjects while 79(84.9%) were normal, no defect in visual field were found in any of 93 subjects.

All the workers were working in different light situations. Most of the workers had no complain of ocular injuries because of protection devices while 19.4% present history of ocular injuries. Kind of ophthalmic injury were physical, chemical and electrical injuries, out of 19.4% subjects, physical injury was displayed in 15.1%. Vision problem after injury were 11.8%, reported that they had double vision after ocular injury and 3.2% reported blurring. 5.4% subjects had visual threatening ocular disease out of them 3.2% subjects had cataract, and 2.2% had diabetic retinopathy. They were referred to Mayo Hospital for their assessment and treatment. All the workers were provided with protective devices by their industry. 85.5% were provided with safety goggles and 14.5% with shield.

Previous studies assessed the recognition of professional hazards, factors connected with awareness and use of Personal Protective Equipments in automobile repair artisans.

Professional risk cause severe health problems in workers because of polluted environment and lack of safety devices at the workplace. Automobile repair artisan is one occupation that causes the professional accidents and disease related to health. On the basis of this study, 56% workers have awareness on professional danger and 44.3% of workers were using the protective devices. According to analysis the workers who were educated and have job duration of more than years and less prone to occupational hazard than uneducated people.[27]

A previous study reported that most of the ophthalmic disorders associated with professional hazard and provided with safety measurements. 38.7% had eye wears but that don't use them while 32% subjects reported that they were not provided with protecting devices by their industry.[26]

CONCLUSION

This study aimed to evaluate the visual functions in

workers of textile industry in Lahore city. The above results concluded that visual acuity was most affected in workers. Workers were prone to refractive errors which include myopia, presbyopia and hyperopia. Color vision and contrast sensitivity was not much affected and glare effects in low percentage. Most of the subjects were machine operator and maintenance and are more prone to ocular injuries. Patients of vision threatening ocular disease were referred for treatment. Ocular injury ratio can be minimized by using protective measures.

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REFERENCES

1. Hinson AV, Lokossou VK, Schlünssen V, Agodokpessi G, Sigsgaard T, Fayomi B. Cotton Dust Exposure and Respiratory Disorders among Textile Workers at a Textile Company in the Southern Part of Benin. Int J Environ Res Public Health. 2016;13(9):895. Published 2016 Sep 8. doi:10.3390/ijerph1309089 5.
2. Singh Z, Chadha P. Textile industry and occupational cancer. J Occupat Med & Toxicol. 2016;11(1):39.
3. Lillypet S, Jain T, Joseph B. Health problems among garment factory workers: A narrative literature review. J Occupt Health & Epidemiol. 2017;6(2)114-21.
4. Mutlukan E, Dhillon B, Aspinall P, Cullen JF. Low contrast visual acuity changes in human immune- deficiency virus (HIV) infection. Eye.1992;6(1):39.
5. Negiloni K, Mazumdar D, Neog A, Das B, Medhi J, Chouuary M, et al. Construction and validation of logMAR visual acuity charts in seven Indian languages. Indian J Ophthalmol.2018;66(5):641.
6. Nagina V, Jonas JB, Sinha A, Gupta R, Agarwal S. Visual acuity and associated factors. The Central India eye and medical study. PloS One.2011;6 (7):e22756.
7. Radner W, Near vision examination in presbyopia patients: Do we need good homologated near vision charts? Eye & Vis. 2016:3(1):29.
8. Christiff A, Repka MX, Kaminski BM, Holmes JM, Group PEDI. Distance versus near visual acuity in amblyopia. J Am Assoc Pediatric Ophthalmol & Strab. 2011;15(4):342-4
9. Golden JR, Erickson-Davis C, Cottaris NP, Parthasarathy N, Rieke F, Brainard DH, et al. Simulation of visual perception and learning with a retinal prosthesis. J Neurol Eng. 2019;16(2):025003.
10. Moseley MJ, Hill AR. Contrast sensitivity testing in clinical practice. British Ophthalmol. 1994;78(10):795.
11. Arzu.Seyhan Karatepe. Suhelya Kose, and sait Egrilmez. Factors Affecting Contrast Sensitivity in Health Individuals: A Pilot Study.Turk J Ophthalmol.2017;47(2):80.
12. Chang S, Lewis DE, Pearson J. The functional effect of color perception and color imagery. J Vis. 2013;13(10):4.
13. Woldeamanuel GG, Geta TG. Prevalence of color vision deficiency among school children

in Wolkite, Southern Ethiopia. BMC Res Not. 2018;11(1):838.

14. Facchin A, Daini R, Zavagno D, The glare effect test and the impact of age on luminosity thresholds. Front psychol. 2017;8:1132.

15. Shandiz JH, Derakhshan A, Daneshyar A, Azimi A, Moghaddam HO, Yekta AA, et al. Effect of cataract type and severity on visual acuity and contrast sensitivity. J Ophthalmic & Vis Res. 2011;6(1):26.

16. Sakai RE, Feller DJ, Galetta KM, Galetta SL, Balcer LJ. Vision in multiple sclerosis (MS): The story, structure-function correlations, and models of neuroprotection. J Neuro-Ophthalmol. 2011;31(4):362.

17. Weil RS, Schrag AE, Warren JD, Crutch SJ, Lees AJ, Morris HR. Visual dysfunction in Parkinson's disease. Brain. 2016;139(11):2827-43.

18. Broadway DC. Visual field testing for glaucoma-a practical guide. Comm Eye Health. 2012;25(79-80):66.

19. Corbett JJ,Savino PJ, Thompson HS, Kansu T, Schatz NJ, Orr LS, et al. Visual loss in pseudotumor cerebri: follow up of 57 patients from five to 41 years and a profile of 14 patients with permanent severe visual loss. Arch Neurol. 1982;39(8):461-74.

20. Orcutt J, Page N, Sanders M. Factors affecting visual loss in benign intracranial hypertension. Ophthalmol. 1984;91(11):1303-12.

21. Omoti A, Edema O, Aigbotsua P. Non-traumatic ocular findins in industrial technical workers in Delta State, Nigeria. Middle East Afr J Ophthalmol. 2009;16(1):25.

22. Kant R. Textile dyeing industry and environmental hazard. 2011.

23. Al-Mahdi HS, Bener A, Hashmi SP. Clinical pattern of pediatric ocular trauma in fast developing country. Int Emerg Nurs. 2011;19(4):186-91.

24. Alleyne G, Breman J, Claeson M, Evans D, Jamison D, Jha P, et al. Disease control priorities in developing countries. World Bank/OUP; 2006.

25. Indhushree R, Monica R , Coral K, Angayarkanni N, Punitham , S ubburathinam B, et al. Visual functions of workers exposed to organic solvent in petrochemical industries. Indian J Occupat & Environ Med. 2016;20(3):133.

26. Van der Pols J, Bates C, McGraw P, Thompson J, Reacher M, Prentic A, et al. Visual acuity measurements in a national sample of British elderly people. British J Ophthalmol. 2000;84(2):165-70.

27. Marahatta SB, Gautam S, Paudel G, Yadav UN. Awareness of occupational hazards and associated factors among automobile repair artisans in Kathmandu Metropolitan City, Nepal. Indian J Occupational & Environmental Med. 2018;22(1):49.