

Original article

30

OCULAR HEALTH ASSESSMENT OF WORKERS IN VARIOUS CHEMICAL and PHARMACEUTICAL INDUSTRIES

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ABSTRACT

BACKGROUND:

Workers working in chemical industry are exposed to thousands of chemical. Some of these chemicals have a direct effect on eye and ocular health and can cause ocular problems. So this study aimed to determine the ocular exposure to chemicals in different chemical /pharmaceutical industries.

METHODS:

A clinical examination was accompanied by a detailed occupational history. The examination of technical workers includes visual acuity, color vision, torch light and slit lamp examination, stereopsis, dry eye conditions, fundus evaluation, objective and subjective refraction and visual field testing.

RESULTS:

Total 203 workers were included in study from different chemical / pharmaceutical industries. There was a greater prevalence of anterior segment disorders (40%) over posterior segment diseases (2%) within exposed areas. 40% workers had anterior segment diseases and out of this, prevalence of cataract is 74%, which is higher than any other anterior segment diseases. 86% workers were not using any kind of PPE during their work. 69% workers experienced dry eyes in both eye and 58% workers had reduced stereopsis.

CONCLUSION:

Workers exposed to chemicals developed more anterior segment disorders e.g. dry eye, allergic conjunctivitis, cataract etc. Almost all of occupational eye disorders are more easily prevented than treated.

Several preventive measures are now available. With such preventive measures readily available, both employers and employees must work aggressively to decrease the number of workers affected with an occupational eye disorders.

There is an intense need of periodic industrial vision screening, so occupational related eye diseases can be easily prevented and early detected. Easy prevention & early detection can save worker's eyes and vision.

Introduction

Chemical/Pharmaceutical industries are the industries that creates an immense variety of products which impinge on virtually every aspect of our lives. Chemical industry is very diverse, comprising basic or commodity chemicals, speciality chemicals derived from basic chemicals (adhesives and sealants, catalyst etc). The growth of industries with newer chemicals and processes have increased the occurrence of occupational diseases. Polymers and plastics, especially polyethylene, polypropylene, polyethylene terephthalate, polystyrene and polycarbonate comprise about 80% of the industries output worldwide. Amines like DMA, DMEA, TEA, TEDA, DMAEE, MP, MMP, EMP, DMAEA, and DMIPA have moderate to large quantities of exposure in work places.

Chemical industrial work environment has introduced a new set of ocular and visual complaints and disorders. The effect on the individual who loss vision in the work accident is devastating. It is estimated that 90% of all ocular injuries are preventable. Literally, thousands of chemicals are used in industry today, some of these chemicals have a direct effect on pre-existing ocular abnormalities and may indirectly cause ocular problems. Various amines, such as triethylamine and N,N-dimethylethyamine, have been reported to cause corneal edema and vesicular collection of fluid within the corneal subepithelial cells. Symptoms due to exposure to amines are blurring of vision, a blue-green appearance of objects and halos around light that are probably reversible.

There are many another chemical affects on eye that includes eye irritation and burning sensation, hyphaema, cataracts, blindness, corneal ulceration, glaucoma etc. According to OSHA, personal protective equipments are devices designed to protect employees from serious workplace injuries or illnesses resulting from contact with chemical or metal splash, dust, flying particles, corrosive gases or vapors, or radiation. Basically, there are PPE used for protection of the eyes from hazard, that protection devices includes, general goggles, laser safety glasses, chemical splash goggles and impact goggles. Full face protection is achieved by wearing face shields.

Aim

The aim of the study is to assess ocular health in different chemical/pharmaceutical industries.

The ocular health includes:

1. Anterior and posterior segment
2. Visual acuity
3. Visual field

4. Stereopsis
5. Color vision
6. Dry eye condition

Materials and Methodology

A cross sectional randomized study was done at different chemical and pharmaceutical industries in Ahmedabad and surrounded A 'Bad areas such as GIDC and different industrial areas. Authorization for the study was obtained from management of the chemical/ pharmaceutical industries selected. Subjects were enrolled in study after obtaining the informed consent.

INCLUSION CRITERIA:

- Technical workers of industries

EXCLUSION CRITERIA:

- Non-technical workers of industries
- Workers who are not willing to participate

MATERIALS:

Following instruments were used in this study:

- Torch
- Portable Slit-lamp biomicroscope
- Direct ophthalmoscope
- Retinoscope
- Snellen's distance and near visual acuity charts
- Trial case
- Titmus fly test
- Ishihara pseudo- isochromatic plates
- Schirmer's strips

METHOD:

Technical workers are participated in ocular examination. The ocular examinations were done by an ophthalmologists and an optometrist.

A structured protocol was followed for each worker including data Age, Gender, current job, working shifts, working hours, visual symptoms, family history and past medical & ocular history

Further workers were using PPE or not have also been noted.

In addition to demographic data, Ocular health status is assessed by the help of various instruments.VA was measured using the Snellen's distance and near visual acuity charts. Each eye was tested separately with and

without glasses where applicable and subsequently refracted using streak retinoscope to rule out refractive error. If their VA less than 6/6, the refractive error further classified in to myopia, hypermetropia and astigmatism. Near VA was tested using N notation reading charts. Near correction was given to those who have near VA less than N6 to rule out presbyopia. Color vision was tested with ishihara pseudo- isochromatic Plates and findings noted as normal or abnormal. Torch light examination was done with torch to rule out any anterior segment abnormalities. Detail eye examination was done by portable slit-lamp, stereopsis was measured with titmus fly test, fundus was examined with direct ophthalmoscope, dry eye was examined with schirmer test, and visual field testing was done with confrontation test.^(8,9)

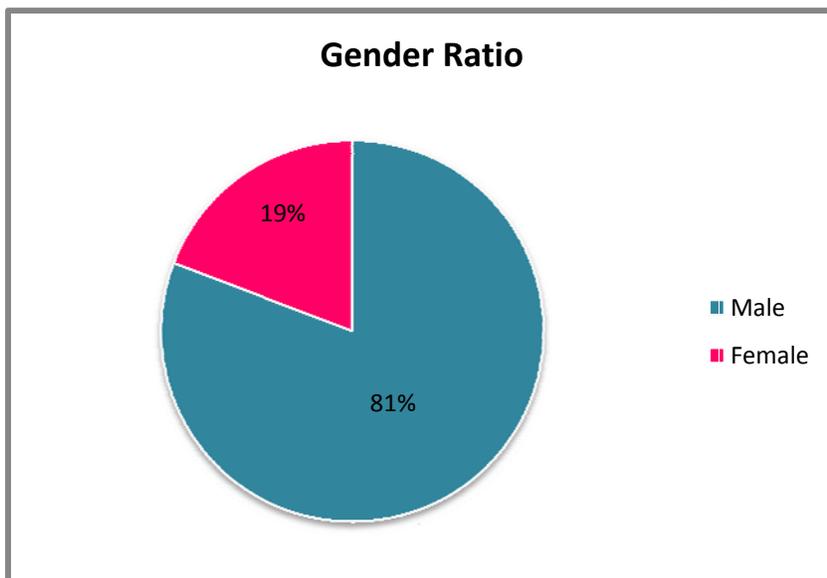
After all the tests were done, workers were informed about their findings. Based on findings further evaluation was required then workers were referred to Shree C.H. Nagri municipal eye hospital.

Statistical analysis was done using graphical methods.

Results

The study was consisted of total 203 workers from different chemical / pharmaceutical industries.

GRAPH-1 Gender Ratio

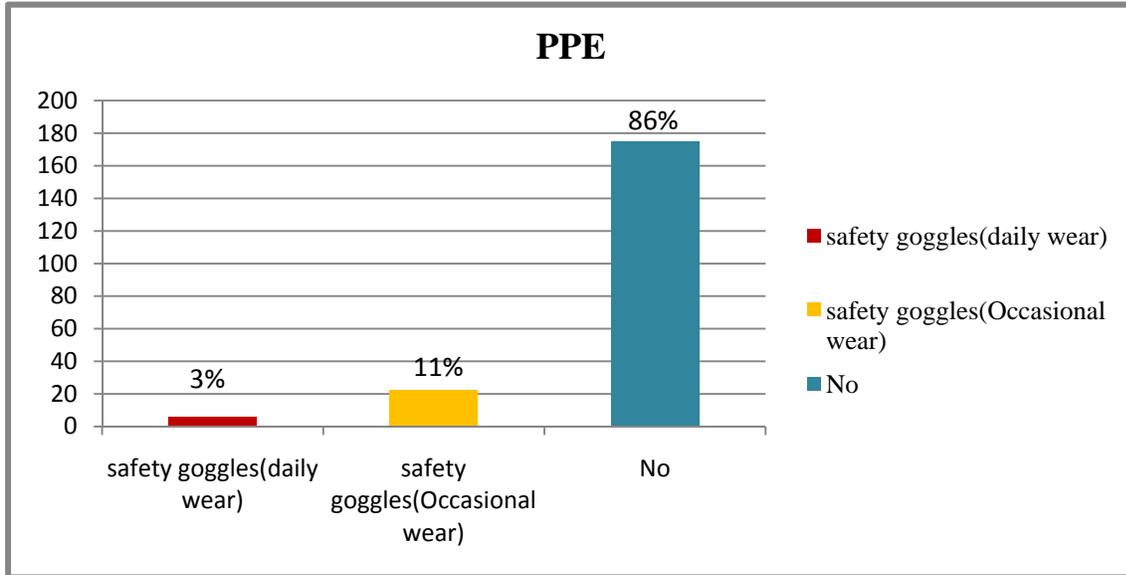


MALES	FEMALES
164	39

203 workers were included in the study.

Out of that 164 workers were male and 39 workers were female.

Graph-2 Use of PPE

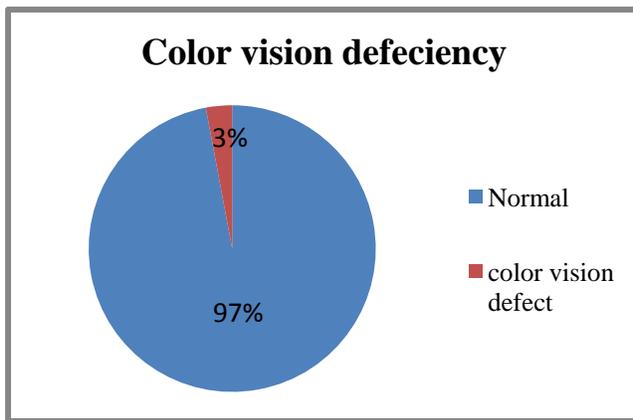


Out of 203 workers only 3% workers preferred to use safety goggles as a daily basis, 11% workers preferred to use safety goggles as an occasional use and 86% workers not used any kind of PPE.

Graph-3 Presence of Refractive error & Presbyopia

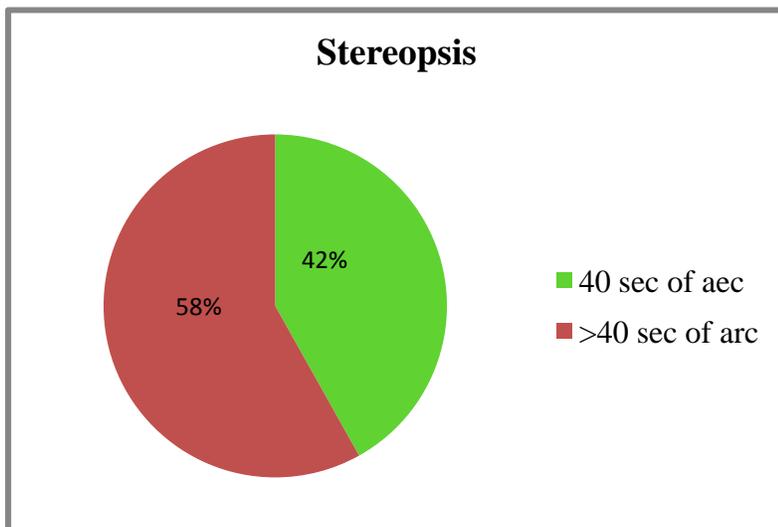
Out of 203 workers, 124 workers had no refractive Error, 41(20%) workers had Myopia, 18(8%) workers had Hyperopia, 20(9%) workers had astigmatism and 71(34%) workers had presbyopia.

Graph-4 Color vision Defect

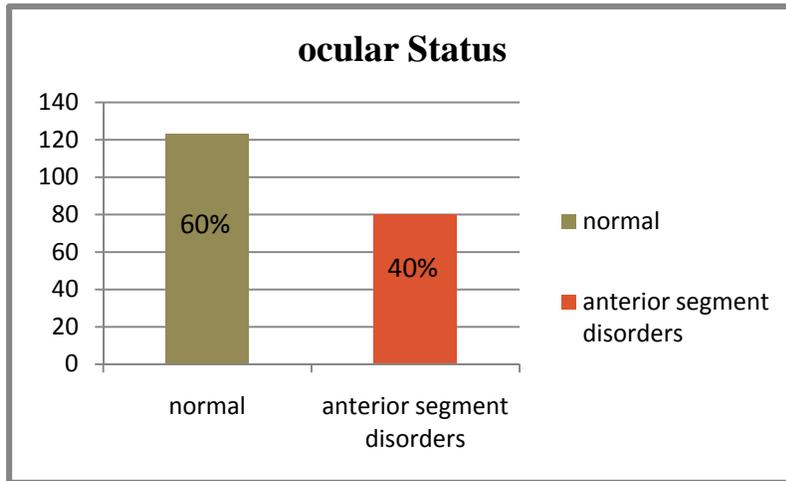


Out of 203 workers, 97% workers had normal color vision and only 3 % workers had color vision abnormality.

Graph-5 Stereopsis



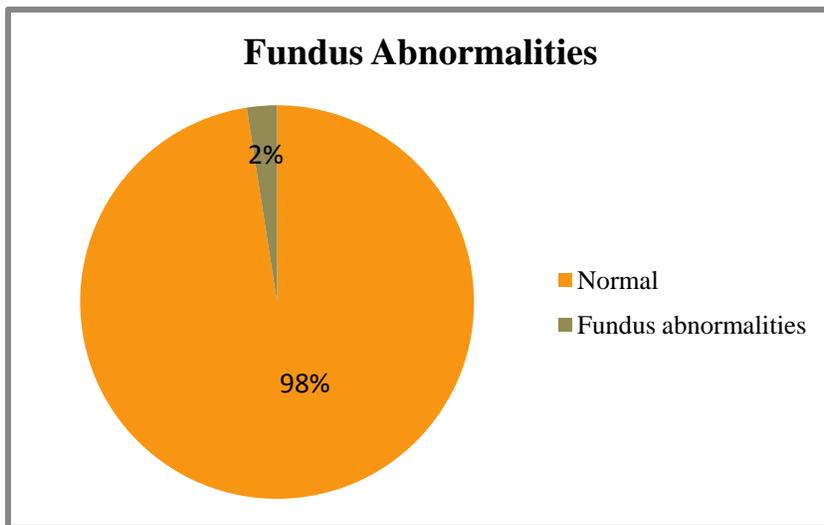
Out of 203 workers had and 42% stereopsis



workers, 58% reduced stereopsis workers having within normal limit.

Graph-6
Abnormalities

Posterior segment



Out of 203 workers, 98% workers having normal posterior segment & only 2% workers experienced fundus abnormalities.

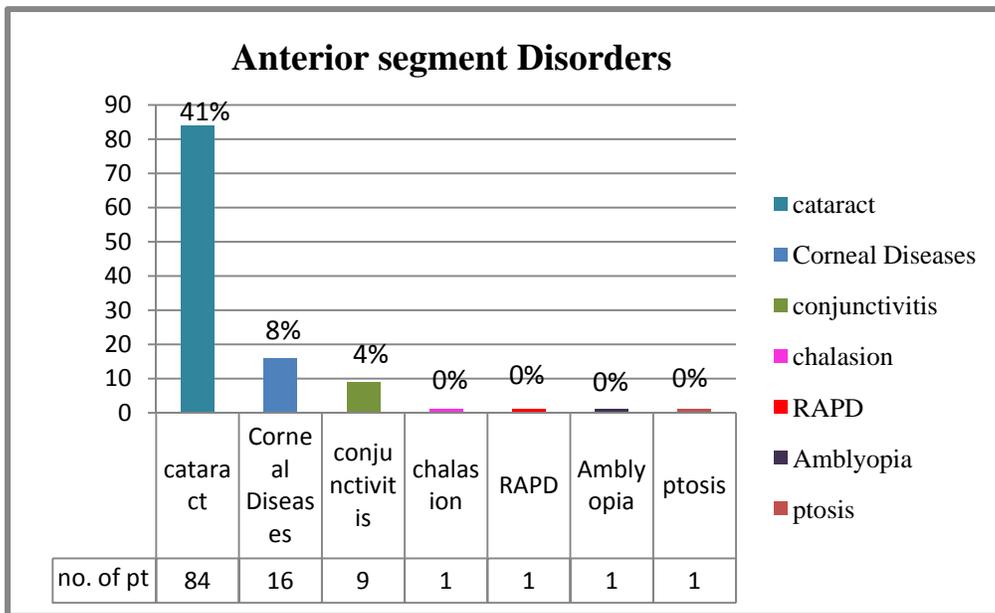
Graph-7 Ocular Abnormalities

[A] Ocular health Status

Out of 203 workers, 40% workers had anterior segment disorders and remaining workers had anterior segment within normal limit.

[B] Anterior segment disorders

Graph
all the
that is

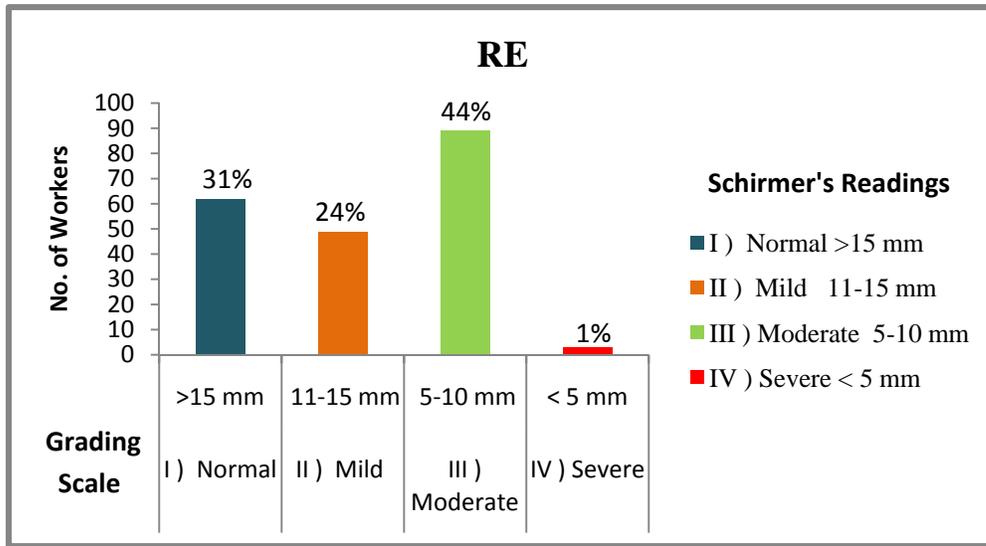


B
included
anterior
segment
diseases
cataract,
corneal

diseases (keratitis, corneal opacities, Arcus senilis' keratoconus, pterygium), conjunctivitis, Chalasion, ptosis , RAPD, and Amblyopia. Out of these prevalence of cataract is higher (41%) than any inflammatory conditions and other diseases.

Graph- 8 Dry Eye

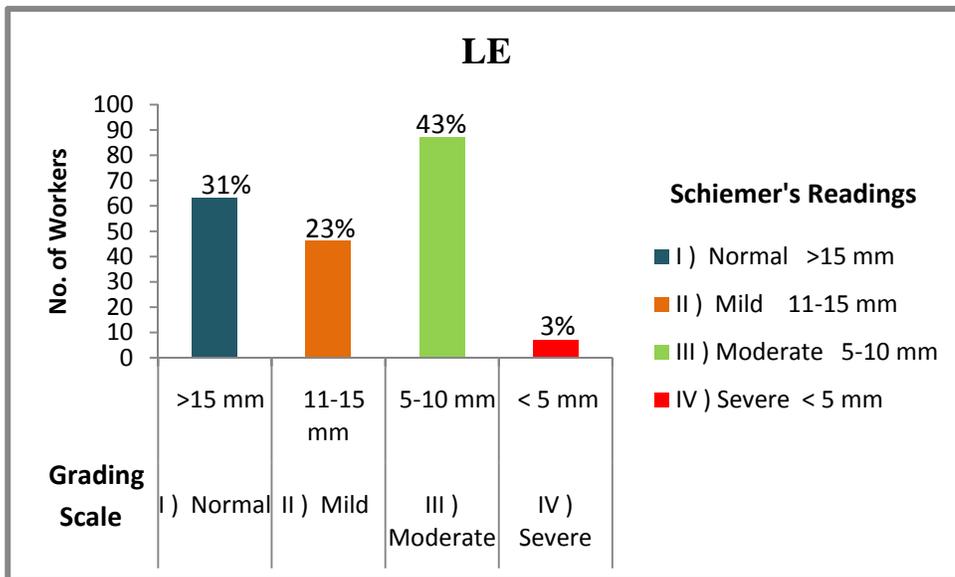
[A]



[B]

203

the



workers

included in

study. The

measurement was taken with the help of Schirmer strips. Readings was taken in mm.

A reading >15 mm was considered as a Normal. Here criteria have been proposed to grade a severity of dry eye.

The severity scale of dry eye categorized into 4 grades:

Grade I: Normal (> 15mm)

Grade II: Mild (11-15mm)

Grade III: Moderate (5-10mm)

Grade IV: Severe (<5mm)

In graph A: 24% workers suffer from mild dry eye, 44 % workers suffer from moderate dry eye and 1% workers suffer from severe dry eye.

In graph B: 23% workers suffer from mild eye, 43% workers suffer from moderate dry eye and 3% workers suffer from severe dry eye.

Out of 203 workers, 69% workers experienced dry eyes in BE (prevalence of moderate dry eye is higher than the other grades of severity).

Discussion

This study presents the results of ocular health screening of 203 samples of workers; it gives some insight into the ocular health status of chemical Industrial workers.

With reference to the study Visual Profile of the Small Scale Industry Workers at the Ambattur Industrial Estate, Chennai done by Salai Dhavamathi Janarthanan, Jayarajini Vasanth, Anitha Reddy and Monica Chaudhry. The most common visual disorders were uncorrected presbyopia (37%), uncorrected refractive error (36.93%), Colour vision defect was found in (10.8%) and cataract in (6.3%). None of them used protective eye wears. After correction 35.1% have refractive errors with 24.3% hyperopes and 10.8% myopes. According to current study 20% workers had myopia, 8% workers had hypermetropia and 9% workers had astigmatism, the population of presbyopia was 34%. 83% workers did not prefer to use of any type of personal protective equipments. 11% workers used PPE on frequent wear basis and only 3% workers used PPE as a daily wear basis. 3% workers experienced color vision defect, 58% workers had reduced stereopsis and all the workers have visual field within normal limits. Only 2% workers had retinal diseases. No workers had visual field defect.⁽⁷⁾

Comparing present study with the survey on eye safety in the work environment and the role of the optometrist by Kovin S Naidoo, Jyotikumar ie Jaggernath, Yashika I Maharaj. It can be said that studied by the method of case history, monocular & binocular vision, color vision test, objective and subjective refraction, ocular health(slit-lamp, Tonometry & fundus examination) and visual field. Chemical products, wastes and toxins associated with chemical industrial processes and activities cause eye irritation, eye injuries, blindness and even permanent ocular damage. Out of 203 workers, 69% workers experienced dry eyes in BE (prevalence of moderate dry eye is higher than the other grades of severity) and 31% workers had normal eyes. Workers exposed to chemicals developed more anterior segment disorders e.g. dry eye, allergic conjunctivitis, cataract etc. Almost all of occupational eye disorders are more easily prevented than treated.⁽⁶⁾

According to current study of 203 workers, 40% workers had an anterior segment disorders and out of this prevalence of cataract is 74%, which is higher than any other anterior segment diseases. Out of 203 workers, 69% workers experienced dry eyes in BE (prevalence of moderate dry eye is higher than the other grades of severity) and 31% workers had normal eyes which match the results of the study done by Aboobaker bulbulia, Riaez shaik, Nazima khan and Sarah vayej on ocular health status of chemical industrial workers. A questionnaire was administered on 78 workers in chemical factory according to those exposed and non exposed to chemicals. Prolong chemical exposure can produce photophobia, tear disorders, anterior segment disorders, cataract, dry eye conditions, allergic conjunctivitis, conjunctival melanosis. Occupational exposure to chemicals should be reduced and exposure protocols at work need to be revised in order to reduce the prevalence of occupational related eye disorders. ocular health status of chemical industrial workers, ocular disorders are More prevalent in exposed workers (73.1%) than in non-exposed Workers (43.6%).⁽³⁾

Conclusion

Several preventive measures are now available. With such preventive measures readily available, both employers and employees must work aggressively to decrease the number of workers affected with an occupational eye disorders.

Visual safety in any workplace extends beyond the prevention of eye injuries. It also includes periodic visual assessments and recommendations from an optometrist on eye safety protective eye wear that are appropriate to a particular task of the worker.

An optometrist must be engaged to educate workers and employers on all aspects of eye health and safety in the workplace, as well as to ensure that essential components of eye safety programmes are appropriately established and adhered to.

This will enhance eye safety in the workplace and ensure greater work efficiency and productivity. There is an intense need of periodic industrial vision screening, so occupational related eye diseases can be easily prevented and early detected.

Easy prevention & early detection can save worker's eyes and vision.

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