ORIGINAL ARTICLE

A Study on Ocular Morbidities among Industrial Workers in a Heavy Engineering Industry

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ABSTRACT

Background: The term ocular morbidity describes conditions creating both visual impairment and non-visual pathology. The World Health Organization (WHO) states that blindness and visual impairment are serious global health issues which can have a negative impact on employees' health, especially their eyes, which are susceptible to illnesses and injuries. **Methods:** It is a cross-sectional study conducted among 96 workers in a heavy engineering industry in Hosur, Tamil Nadu to estimate the prevalence of ocular morbidity. Simple random sampling was employed to select the participants. The data was collected using a semi-structured questionnaire and analyzed using SPSS version 27.0. Chi-square and Fisher's exact tests were applied to determine the statistical significance considering p-value as < 0.05. **Results:** Among 96 workers who participated in the study, the prevalence of ocular morbidity was found to be 41%. Allergic conjunctivitis was the most common condition found among 30% of participants followed by cataracts (6%) and refractive error (3%). This higher prevalence of ocular morbidity is associated with factors like low literacy level, rare use of protective eyewear and prior eye examinations (p-values: 0.001, 0.015, 0.0001). **Conclusion:** The study concludes that the heavy engineering industrial workers are prone for ocular morbidities like allergic conjunctivitis, cataracts and refractive errors Addressing these concerns through regular vision screenings, workplace safety measures, and awareness programs is crucial.

KEY WORDS: Ocular morbidity, Industrial workers, Heavy engineering industry

Introduction

The term ocular morbidity refers to a broad range of eye-related conditions that may cause visual impairment or other forms of ocular dysfunction[1]. According to WHO estimates, more than two billion people globally live with some form of visual impairment, a substantial portion of which is preventable. Vision impairment is either untreated or could have been avoided in at least 1 billion of affected population[2]. Cataracts and refractive errors are the two main causes of blindness and vision impairment globally.

According to reports, 3 to10% of all occupational injuries are related to the eyes. The ocular morbidities vary from pingueculae, allergic conjunctivitis, pterygium, refractive errors to foreign body injuries depending on the type of industry and workplace hazards[3]. Furthermore, a major risk factor in determining the effect on ocular health is the availability of protective eyewear in the workplace. Lack of which can have a negative impact on employees' health, especially their eyes, which are susceptible to illnesses and injuries[4].

According to various studies, the prevalence of ocular morbidities in India is consistently reported as high, ranging from 20% to 90%[5]. Currently, many research indicates that there is a significant prevalence of ocular morbidity among industrial workers in Tamil Nadu. Studies have shown that workers in industries such as metal and marble processing have a high rate of refractive errors, pterygium, and foreign body injuries, which are frequently linked to inadequate safety procedures and inadequate eye protection[6]. However, precise data regarding the prevalence across various industries in Tamil Nadu is limited and may differ based on the study population and work environment. Therefore, the study aimed to estimate the prevalence of ocular morbidity among industrial workers in a heavy engineering industry.

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Materials And Methods

This was a Cross-sectional study conducted in a heavy engineering industry in Hosur, Tamil Nadu from August 2024 to September 2024 after obtaining approval from institutional Ethics Committee. Employees above 18 years of age who had minimum of one year of work experience were included in the study. Sample size calculation was done assuming a 95% confidence interval and precision of 5%, using data from a study by Praveena *et al.*,[7] resulting in a required sample size of 96. Study participants were selected using simple random sampling technique and informed consent was obtained after explaining the purpose of the research study in the local language.

Data was collected using a pretested, semi-structured questionnaire which was prepared after reviewing the literature from similar articles. The questionnaire consisted of two sections. Section A consisted of questions related to the socio-demographic information, including age, sex, address, education, occupation, and income. Section B consisted of details regarding working environment and occupational exposure related to ocular morbidity.

The collected data were entered into Microsoft Office Excel and analysed using Statistical Package for Social Sciences (SPSS) version 27. Descriptive data were expressed in frequencies and percentages. The chi-square and Fisher's exact tests were applied to determine the association between occupational exposure and ocular morbidity. Statistical significance was set at 5% ($p<0.05$).

Results

The study was conducted among 96 workers aged 18 to 60. The mean age of the participants was 43±7.45. Most of the participants were in the age group of 41 to 50 years (41%), followed by 31- 40 years of age (33%). Nearly 94% of participants were males and only 6% were females. 35% of study participants had completed their education up to higher secondary and graduate level, 20.8% up to primary level, and the remaining 8.4 % up to the secondary level of education.

Table 1: Distribution of Study Participants Based on Ocular Morbidity (n = 96)

Variables	Frequency (n)	Percentage (%)
Ocular morbidity		
Present	39	40.63
Absent	57	59.37
Type of ocular morbidity		
Cataract	6	6.25
Allergic conjunctivitis	29	30.20
Refractive error	4	4.17
None	57	59.38

Among the 96 participants who took part in the study, most participants (95.8%) had 6 to 10 years of experience, 3.1% of participants had 1–5 years of experience, while the remaining 1.1% had work experience of more than 10 years. Most of the study participants were quality control personnel (22.9%), followed by machine handlers (17.7%), electricians (11.5%), welders (10.4%). 34.4% reported that they had exposure to dust particles, 3.1% to high-intensity light, another 3.1% to Metallic dust, 1% had exposure to high temperature, and the remaining 58.4% of participants reported that they did not have exposure to any of the occupational hazards during work. 63 participants (65.6%) used safe measures like face shield, safety glass and helmets for eye protection at the workplace, while the remaining 33 workers (34.4%) reported that they did not use any safe measures for protecting their eyes during the workplace. 39 participants (40.63%) reported having conditions of Ocular morbidity, while the remaining 57 participants (59.37%) did not have ocular morbidity [Table. 1].

Table 2: Association of Various Socio-Demographic Factors with Ocular Morbidity

Variables	Ocular Morbidity Absent (n = 57)	Ocular Morbidity Present (n = 39)	Chi-square / Fisher's Exact Test	p-value
Age (years)			**1.889**	**0.596**
18–30	1	2		
31–40	17	15		
41–50	25	14		
>50	14	8		
Gender			**3.035**	**0.219**
Female	5	1		
Male	52	38		
Education			**16.139**	**0.001**
Graduate	21	7		
Higher secondary	27	7		
Primary	8	14		
Secondary	1	11		
Nature of Work			**8.878**	**0.353**
Electrician	5	6		
Machining	7	10		
Maintenance	5	0		
Manager	4	5		
Production	3	2		
Quality control	15	7		
Security	6	3		
Supervisor	5	3		
Welding	7	3		

Table 3: Association of Various Work-Related Factors with Ocular Morbidity

Variables	Ocular Morbidity Absent (n = 57)	Ocular Morbidity Present (n = 39)	Chi-square / Fisher's Exact Test	p-value
Work Experience			**1.534**	**0.464**
1–5 years	1	2		
6–10 years	55	37		
>10 years	1	0		
Use of Eye Protection During Work			**10.453**	**0.015**
Always	14	11		
Never	34	12		
Rarely	6	13		
Sometimes	3	3		
Attended Training on Eye Safety			**0.001**	**0.977**
No	3	2		
Yes	54	37		
Previous Eye Examination			**15.741**	**0.0001**
No	28	4		
Yes	29	35		

41% (39 participants) were found to have Ocular morbidity. Allergic conjunctivitis was the most common condition reported by 30% of participants, followed by cataract (6%), and only 4% of workers reported having refractive error. When the socio-demographic factors and other work-related factors were assessed in relation to ocular morbidity, it was found that ocular morbidity was found to be higher among those who had lower educational status (p=0.001), who rarely used the safety measures for eye protection during work (p=0.015) and workers who had eye examination before the study (p=0.0001) ([Tables. 2] and [Tables. 3]).

Discussion

Our study assessed ocular morbidity and its associated factors among industrial workers in a heavy engineering industry. The mean age of our study participants was 43±7.45 years and the largest age group was 41 to 50 years (41%), similar to a study by Patel PK, *et al.*[4].

In this study, majority were males (94%). Similarly, in studies by Budhathoki SS and Adak P *et al.*,[8, 9] most of the study participants were males. The male dominance in the field could be due to the reason that the industrial work is a physically demanding job, that too in a heavy engineering industry. Our study observed that the study participants had exposure to dust particles, high-intensity light, metallic dust and high temperatures which contributed to ocular morbidities like allergic conjunctivitis, cataract and refractive errors. Similar study across multiple industrial sectors by Tiwari P, *et al.* [10] also documented high rates of ocular morbidity and implicated hazards like dust particles, chemical and metal dust exposure. This was due to fact that the workers were mainly from the production department, welding and quality control.

The present study highlighted a considerable burden of ocular morbidity among workers in the heavy engineering industry, with 40.63% of the participants having at least one ocular morbidity. Among the ocular morbidity, allergic conjunctivitis (30%) was predominant, followed by cataracts (6%) and refractive error (4%). This finding underscores the occupational risk to eye health in industrial settings, where workers are routinely exposed to mechanical, chemical and environmental hazards. Similarly, a cross-sectional epidemiological study among 638 metal workers in Noida, Uttar Pradesh reported a similar high burden of visual impairment and ocular conditions, with 56.26% of workers having at least one ocular morbidity. In that study 25.91% had refractive error, 12.81% had presbyopia and 8.64% had cataract[10]. These similarities suggests that workplace exposures such as dust, poor lighting, lack of protective eyewear usage and other industrial irritants are the common risk factors across different sectors of Indian industry. Also, a study by Kwaku Tetteh KK found 47.9% prevalence of ocular injuries among electric/arc welders[11]. This higher prevalence of ocular morbidity could be due to the low literacy level, rare use of safety gear, and prior eye examinations (p-values: 0.001, 0.015, 0.0001), which parallels with other studies that demonstrated low awareness of hazards and poor protective practices[10, 11].

A study by Pathan FA, *et al*. on ocular morbidity among garments workers found that 62.4% of the participants had at least one ocular morbidity, with refractive error (35.2%) and presbyopia (7.2%) being dominant. This indicates the pattern seen in industrial settings and suggests that workload-related vision strain is a broader occupational issue across different industrial work environments[12].

Another similar study by Adak P, *et al.*,[9] occupational eye injury was a common problem and almost all workers lacked protective eyewear or safety training. Also, the study observed frequent complaints that included ocular itching, irritation, and conjunctival symptoms, aligning with the high allergic conjunctivitis prevalence in our study. Even though this study focused more on occupational injuries than specific conditions like refractive error or conjunctivitis, it highlighted the significant ocular burden in industrial population where safety practices are minimal.

These findings highlight the necessity of enhanced workplace safety laws, routine eye examinations, and health education on eye protection. To lessen the strain on industrial workers' visual health, employers encouraged to implement comprehensive eye health programs and provide access to protective equipment.

Conclusion

The study provides an insight into the epidemiological characteristics of occupational ocular morbidity and concludes that the prevalence of Ocular morbidity among the participants was identified to be 41% (39 workers), with allergic conjunctivitis being the most common condition (30%) followed by cataract and refractive error. On analysing the factors, educational status, Use of personal protective equipment, exposure to dust particles, and previous eye examination were found to have significant association with Ocular morbidity.

Contribution Of The Authors

Dr Roopashree Kamisetty and Dr Sathish Kumar - conception, design, analysis, and interpretation of data.

Dr Swathe P and Dr Sathish Kumar - analysis and drafting the manuscript.

All the authors approved the final version to be published.

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