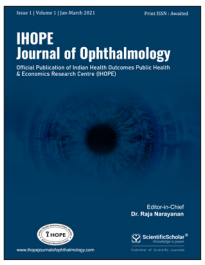
www.ihopejournalofophthalmology.com

ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

IHOPE Journal of Ophthalmology



Original Article

Prevalence of ocular morbidity among industrial workers of Eastern Nepal

Pradeep Kumar Patel[1], Sanjay Kumar Sah[1], Pankaj Ray Adhikari[1], Rajiv Ranjan Karn[2]

[1]Department of Optometry, Biratnagar Eye Hospital, [2]Eastern Regional Eye Care Program, Biratnagar Eye Hospital, Biratnagar, Nepal.

***Corresponding author:**
Pradeep Kumar Patel,
Department of Optometry,
Biratnagar Eye Hospital,
Biratnagar, Nepal.

pradeeppatel00616@gmail.com

Received: 09 December 2023
Accepted: 06 January 2024
Published: 31 January 2024

DOI
10.25259/IHOPEJO_25_2023

Quick Response Code:

ABSTRACT

Objectives: The study aimed to investigate the prevalence of ocular morbidity among industrial workers.

Materials and Methods: A descriptive cross-sectional study was carried out in four industries of Koshi Province. The demographic information gathered encompassed details such as age and gender. Employment-related factors included the nature of work, years of experience, and the type of industry. Economic considerations, such as monthly pay scale and job responsibilities, were also explored. Educational background and awareness of ocular hazards in the workplace, along with knowledge about safety devices, constituted crucial components of the survey. Comprehensive ocular examinations, along with assessments for color vision, contrast sensitivity, and stereopsis, were carried out on-site in collaboration with the outreach team of Biratnagar Eye Hospital. A structured schedule was administered through face-to-face interviews and documented.

Results: In the present study, A total of 359 industrial workers were screened; among them, 321 (89%) were male, and 38 (11%) were Female, with a mean age of 43.72 ± 10.18. The majority of them were from 40 to 49 years of age group 135 (37.6%). The overall prevalence of ocular morbidity among the workers was 289, (80.50%). The highest rate of ocular morbidity was seen in sugar industry 98, (89.9%) followed by the jute industry 85, (80.18%), the soap industry 59, (74.68%), and the dairy industry 47, (72.30%). Presbyopia 166, (46.23%) emerged as the most common ocular morbidity among all workers. A history of ocular injuries was found in 115, (32%) of workers, and only 19% of workers used ocular safety devices. The main reason for not using ocular safety devices was due to unavailability (65%).

Conclusion: The research highlights a significant prevalence of ocular morbidity among industrial workers, with presbyopia emerging as the most common ocular disorder.

Keywords: Ocular morbidity, Injuries, Ocular safety devices, Industrial workers, Eastern region of Nepal

INTRODUCTION

Ocular morbidity was defined as the spectrum of eye diseases, which include both visually impairing and non-visual impairing ocular conditions.[1] Worldwide, there are 246 million individuals with impaired vision, and 39 million among them are blind.[2] The majority of vision impairments, approximately 80%, can be prevented, treated, or cured. In developing nations, where ocular morbidities pose a significant public health challenge, around 90% of the global blind population resides.[3] Occupational eye disorders represent a complex group of traumatic injuries, harmful exposures, undiagnosed ocular diseases, eyestrain, fatigue, and other miscellaneous ocular complaints.[4] The industrial work environment has given rise to issues with detrimental effects on ocular health, leading to diseases, visual impairment, and blindness. These

outcomes stem from the prevalent industrial hazards within the work environment. Industrial and occupational factors significantly contribute to morbidity rates, causing suffering for workers and their families. This scenario adds to the overall societal burden by causing lost productivity and increased reliance on medical and welfare services.[5] Various factors, including socioeconomic variables such as age, gender, type of occupation, income level, and the duration spent working in a particular environment, can influence ocular morbidity. In addition, the provision of eye protection against the hazards prevalent in the work environment plays a crucial role in determining the impact on ocular health.[6] These hazards can have adverse effects on workers' health, particularly on their eyes, which are vulnerable to injury and diseases.

The prevalence of ocular morbidities in India is consistently reported as high, ranging from 20% to 90%, according to various studies.[7-10] A study from Eastern Nepal found that about 90.7% of morbid conditions were related to injuries during working hours.[11] Work-related ocular injuries were reported between 35% and 60% in different studies, including Nepal.[12-17] The prevalence of uncorrected refractive errors and uncorrected presbyopia has been reported at various rates, between 6% to 45% in several studies.[11,18-20] In several studies, 1–8% of industrial workers, men and 0.4–3% of women have color vision defects.[21,22] Awareness of ocular safety and utilization of ocular safety devices during work and workplace reported to be very low which increases the ocular morbidity.[1,5,13,15,16,21-24]

However, there is limited research on the prevalence of ocular morbidity and its associated factors in industrial workers. The purpose of this study was to assess the prevalence of ocular morbidity and its association with industrial workers in Koshi Province, Nepal.

MATERIALS AND METHODS

A cross-sectional study was carried out in four different industries: the sugar industry, dairy industry, soap industry, and jute industry of Biratnagar Municipality in Koshi Province, Nepal. All the participant were underwent comprehensive optometric examination between March to June 2023. A total of 359 workers were enrolled, and the purposive sampling technique was used. The study was conducted in collaboration with the outreach team of Biratnagar Eye Hospital (BEH), Biratnagar. A Memorandum of Understanding was signed between the industries and the BEH outreach team to conduct the eye screening program, in which the purpose of the study was also explained to them. Appointments were scheduled to do the eye screening, and the workers were advised to bring their previous ocular examination card if they had on the day of screening. Ethical clearance was taken from the Institutional Review Committee (78/A) of the BEH and the study adhered to the Tenets of the Declaration of Helsinki. To conduct the study, all consenting participants were included in the study. The data were collected using a defined clinical proforma and well-structured schedule. A pretesting was done on thirty workers of the pharmaceutical industry and tools were modified.

The clinical proforma and schedule contain data on sociodemographic characteristics, workplace characteristics, history of ocular injury, ocular complaints, use of protective eye devices, and barriers to the use of protective devices. The data were collected through face-to-face interviews by the principal investigator.

All the ocular examination was performed by an optometrist and the test were carried out during the day of eye screening at the scheduled industry. Assessment of uncorrected visual acuity and best-corrected visual acuity (BCVA) for each eye was assessed using the E-optotype of the Snellen chart, which was placed at a 6 m distance from the participant. Visual acuity in the better eye of 6/6–6/12 was considered normal, 6/18–6/60 was classified as visual impairments, and <6/60–3/60 was classified as severe visual impairments.[2] Objective and subjective (Dry) refraction was performed on all of them who needed distance and near spectacles corrections and spectacles were prescribed accordingly. External eye examination and anterior segments examination were performed using a pen torch, and posterior segments were examined by direct ophthalmoscope where lens status and posterior part of the eye was examined and documented, and then, diagnosis was made accordingly.

Visual function assessments such as color vision were assessed with an Ishihara pseudo isochromatic (38 plates) chart at 75 cm, contrast sensitivity with a Hiding Heidi card at 40 cm, and stereopsis measurement was also done using Titmus fly stereo acuity chart at 40 cm after refraction with BCVA for distance and near.

Statistical analysis

Data were entered into Microsoft Excel and exported to the Statistical Package for the Social Sciences version 20 for analysis. Descriptive data were analyzed using frequency and percentage. Pearson's Chi-squared test is used to test associations between variables (demography, awareness of ocular hazards, use of ocular protective devices, and type of ocular protective device used). $P < 0.05$ was considered statistically significant.

RESULTS

A total of 365 industrial workers from four different industries were presented on the day of the eye examination. Among them, six workers did not provide their consent to participate in the study, resulting in non-responses. Among them 321 ,

(89%) were male and 38 ,(11%) were female with the mean age of 43.72 ± 10.18. The majority of them were from 40 to 49 years of age group 135 (37.6%); regarding education levels, the majority of workers had completed primary education 137 (38%). In terms of income, the mean monthly income of the workers was NRs. 22072.42 ± 10090.94. The majority of workers received a monthly income within the range of NRs. 10,000–15,000, which were 117 (32.6%) [Table 1].

There was a reduction in visual impairment after best corrections from 9.2% to 5.8% [Table 2]. Overall, the prevalence of ocular morbidity among the workers was 80.50%. The highest ocular morbidity was seen in the sugar industry 98 (89.9%). Presbyopia 166 (46.23%) was the most common ocular morbidity among all industries [Table 3]. The history of ocular injuries among all the industrial workers was 115 (32%), and the majority of them had superficial conjunctiva or corneal foreign body 88 (76.39%). Moreover, the main source of ocular injury was dust/dirt 66 (57.39%). Most of the workers visited the eye clinic/hospital 220 (61.3%) for their treatment after the ocular injury [Table 4]. There was no significant between association ocular injury with age, gender, occupation but significant association with monthly income ,nature of work and use of ocular safety devices[Table 5]. The most of workers were from the production 141 (39.3%), with a mean work experience was of 12.29 years. Awareness of the use of ocular safety devices was 272 (75.8%), but only 69 (19.2%) workers used ocular safety devices, and unavailability was a major reason 190 (52.9%) for not using ocular safety devices. Only 6 (1.7%) of workers had received training on the use of ocular safety devices.

Table 1: Sociodemographic status.

Description	Frequency	Percentage
Gender		
Male	321	89
Female	38	11
Age in years		
Less than 30	33	9.2
30–39	80	22.3
40–49	135	37.6
50–59	93	25.9
60 and above	18	5
Education		
Primary level	122	34
Lower secondary	72	20
Secondary	65	18
Higher secondary	35	10
University education	44	12
No formal education	21	6
Monthly income (NRs.)		
10,000–15,000	117	32.6
16,000–20,000	110	30.6
21,000–25,000	61	17
26,000 and above	71	19.8
Total	359	100

Table 2: The UCVA and BCVA categories among the workers.

	UCVA *n* (%)	BCVA *n* (%)
Normal visual acuity (6/6–6/12)	326 (90.8)	338 (94.2)
Moderate VI (6/18–6/60)	33 (9.2)	21 (5.8)
Severe VI (<6/60)	00	00
Total	359 (100)	359 (100)

UCVA: Uncorrected visual acuity, BCVA: Best-corrected visual acuity, VI: Visual impairment

DISCUSSION

We assessed ocular morbidity and its associated factors among industrial workers and found a high prevalence of ocular morbidity. In this study, the majority were male; similar findings were found in other studies among industrial workers, welders, and sawmills.[6,11,12] Industrial work is naturally physically demanding jobs, and this could be a reason for the male dominance of the field.

The mean age of our study participants was 43.72 years, and the largest age group was 40–49 years. A similar finding was reported in other studies[12,15,25,26] regarding education level; the majority of workers had completed primary education, and a similar result was reported by a study done in Nepal.[12] This is because the workers were mainly from the production department and labor.

The mean monthly income of workers was NRs. 22072.42. The majority of workers received a monthly income within the range of NRs. 10,000–15,000. This study shows that the wages are not given according to the wages of Nepal law.[27] It might be due to difference in working hours and wages in the private sector, which are not given according to Nepal law.

The present study showed overall prevalence rate of ocular morbidity was 80.50%, which was higher than the other studies done in Nepal.[12,25] workers and 32.1% in rubber industry workers.[25] In our study, the majority of workers were presbyopia; similar findings were reported in a study done in Goa.[25] The reason might be the age of workers were more than 40 years and above.

The prevalence of ocular injury was 32%, and the most common ocular injury was superficial conjunctiva or corneal foreign bodies. Jute industry workers had a high rate of ocular injury, which might be due to tiny dust and dirt particles in the surrounding atmosphere. On the other hand, a study from Malaysia presented a notably higher prevalence of ocular injury, reaching 66.20% among workers.[28]

Table 3: Prevalence of ocular morbidity of workers among four industries.

	Sugar industry (*n*=109)	Dairy industry (*n*=65)	Jute industry (*n*=106)	Soap industry (*n*=79)	Total (%)
Ocular morbidity	98 (89.9%)	47 (72.30%)	85 (80.18%)	59 (74.68%)	289 (80.50)
Presbyopia	54	28	49	35	166 (46.23)
Refractive error+Presbyopia	21	8	6	9	44 (12.25)
Color vision defect	5	6	6	4	21 (5.84)
Cataract	6	2	9	2	19 (5.29)
Refractive error	2	1	7	1	11 (3.06)
Ocular allergy	1	0	1	2	4 (1.11)
Pingicula+Pterygium	4	0	0	3	7 (1.94)
Pseudophakia	1	2	4	0	7 (1.94)
Glaucoma suspect	1	0	1	1	3 (0.83)
Blepharitis+Meibomian gland dysfunction (MGD)	2	0	0	1	3 (0.83)
Squint/Amblyopia	0	0	1	1	2 (0.55)
Diabetic retinopathy	1	0	1	0	2 (0.55)

Table 4: Ocular injury characteristics of the workers.

Variables	Frequency	Percentage
Have had ocular injuries		
Yes	115	32
No	244	68
Types of ocular injuries		
Blunt trauma	13	11.3
Laceration	7	6.08
Lid trauma	7	6.08
Superficial conjunctiva or corneal FB	88	76.52
Source/Cause of injury		
Dust/Dirt	66	57.39
Chemical	20	17.39
Machine	15	13.04
Spray/Splashes	14	12.17
Eye health seeking behaviors after the ocular injury		
Eye clinic/hospital	220	61.3
Self-treatments	39	10.9
Did nothing	99	27.6
Pharmacy/drug store	1	0.3

In our study, we found that 19% of workers were aware of and using ocular safety devices. Out of them, the majority of workers used goggles as ocular safety devices. The main reason for not using any ocular safety devices was due to the unavailability of devices, and only 2% had received training on the use of ocular safety devices. Whereas, another study finding showed that 47.7% of workers used one or more types of PPE.[12]

This study gave insight into the current situation of industrial workers, which will be helpful for policymakers. There is a need to increase awareness about the use of ocular safety devices and regular eye health examinations. Further research will be needed on a large population at the provincial level to generalize the findings.

Table 5 : Factors associated with occupational ocular injuries.

Variables	Have had ocular injury		*P*-value
	No	Yes	
Age in year			0.802
Less than 30	22	11	
30–39	57	23	
40–49	91	44	
50–59	62	31	
60 and above	12	6	
Gender			
Male	214	107	0.47
Female	30	8	
Monthly income in NRs.			
10,000–15,000	61	56	0.001
16,000–20,000	78	32	
21000–25,000	44	17	
26,000 and above	61	10	
Education			
No formal education	14	7	0.45
Primary education	76	46	
Secondary education	86	51	
Higher secondary education	28	7	
Higher education	40	4	
Nature of work			
Production	103	38	0.053
Admin	45	13	
Labor	67	39	
Packaging	29	25	
Awareness of use of ocular safety devices and ocular hazards			
No	183	89	0.052
Yes	61	26	
Use of safety devices			
No	197	90	0.054
Yes	47	25	

CONCLUSION

The research highlights a significant prevalence of ocular morbidity among industrial workers, with presbyopia emerging as the most common ocular disorder.

Acknowledgments

We want to express our sincere appreciation to our friends for their technical assistance; I am deeply thankful to Mr. Amit Mehta and Mr. Rukesh Singh for their guidance, expertise, and continuous support throughout the research process. Their valuable insights and encouragement significantly enriched the quality of this work.

I extend my heartfelt appreciation to Biratnagar Eye Hospital for granting access to their facilities and providing the necessary resources for the data collection. The cooperation and assistance from the medical staff were crucial in ensuring the success of this study. We also want to acknowledge the invaluable assistance provided by the research team of BEH.

Ethical approval

The research/study was approved by the Institutional Review committee at Biratnagar Eye Hospital, number 78/A, dated 24/03/2023.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Agrawal D, Sahu A, Agrawal D. Prevalence of ocular morbidities among school children in Raipur district, India. Indian J Ophthalmol 2020;68:340-4.
2. The international classification of diseases 11 (2018) classification. Visual health - PAHO/WHO. Pan American Health Organization; 2018. Available from: https://www.paho.org/en/topics/visual-health [Last accessed on 2023 Dec 02].
3. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. Br J Ophthalmol 2012;96:614-8.
4. Goldsmith JA, Zabriskie NA, Olson R. Occupational disorders of the eye. In: IRW, editor. Environmental and occupational medicine. 4th ed. Philadelphia, PA: Wolters Kluwer/Lippincott Williams and Wilkins; 2007. p. 701-5.
5. Isaac M, Ndidiamaka O, Juliet I, David N, Chidiebere EE, Rita U, *et al.* Socio economic factors affecting ocular morbidity among industrial workers: A case study of coal Camp Enugu, Nigeria. Int J Healthc Sci 2017;5:222-8.
6. Rom WN, Markowitz SB. Environmental and occupational medicine. 4th ed. Philadelphia, PA: Wolters Kluwer/Lippincott Williams & Wilkins; 2007.
7. Khadse A, Narlawar U, Humne A, Ughade S, Dhanorkar A, Wankhede K, *et al.* Prevalence of ocular morbidities and its correlates in an urban slum of central India. Sch J Appl Med Sci 2014;2:636-41.
8. Sharma M, Singh A. Pattern of treatment compliance among eye patients in a North Indian town. Ann Ital Chir 2008;79:341-6.
9. Dalvi SD, Sathe PV. Survey of ocular morbidity with special reference to senile cataract in rural population. Indian J Prev Soc Med 1985;16:103-10.
10. Sehgal K, Kant L, Jain BK, Lal K. Prevalence of eye diseases in a semi-urban area. Indian J Public Health 1984;28:189-93.
11. Budhathoki SS, Singh SB, Niraula SR, Pokharel PK. Morbidity patterns among the welders of eastern Nepal: A cross-sectional study. Ann Occup Environ Med 2016;28:62.
12. Limbu B, Moore G, Marvasti AH, Poole ME, Saiju R. Work related ocular injury: Nepal. Nepal J Ophthalmol 2018;10:47-56.
13. Fong LP, Taouk Y. The role of eye protection in work-related eye injuries. Aust N Z J Ophthalmol 1995;23:101-6.
14. Blackburn J, Levitan EB, MacLennan PA, Owsley C, McGwin G Jr. A case-crossover study of risk factors for occupational eye injuries. J Occup Environ Med 2012;54:42-7.
15. Eppig T, Speck A, Zelzer B, Langenbucher A. Protective glasses. Personal eye protection for professional use. Ophthalmologe 2014;111:681-90.
16. Ngo CS, Leo SW. Industrial accident-related ocular emergencies in a tertiary hospital in Singapore. Singapore Med J 2008;49:280-5.
17. Okoye OI, Umeh RE. Eye health of industrial workers in Southeastern Nigeria. West Afr J Med 2002;21:132-7.
18. Hashemi A, Khabazkhoob M, Hashemi H. High prevalence of refractive errors in an elderly population; a public health issue. BMC Ophthalmol 2023;23:38.
19. Mukazhanova A, Aldasheva N, Iskakbayeva J, Bakhytbek R, Ualiyeva A, Baigonova K, *et al.* Prevalence of refractive errors and risk factors for myopia among schoolchildren of Almaty, Kazakhstan: A cross-sectional study. PLoS One 2022;17:e0269474.
20. Hashemi H, Fotouhi A, Yekta A, Pakzad R, Ostadimoghaddam H, Khabazkhoob M. Global and regional estimates of prevalence of refractive errors: Systematic review and meta-analysis. J Curr Ophthalmol 2018;30:3-22.

21. Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, *et al.* Executive summary: Heart disease and stroke statistics--2010 update: A report from the American Heart Association. Circulation 2010;121:948-54.
22. Cole BL. Assessment of inherited colour vision defects in clinical practice. Clin Exp Optom 2007;90:157-75.
23. Dain SJ. Materials for occupational eye protectors. Clin Exp Optom 2012;95:129-39.
24. Mendes R. The impact of occupational effects on workers' health. I. Morbidity. Rev Saude Publica 1988;22:311-26.
25. Parulekar P, Naik PG, Perni SG, Vaz FS. Prevalence of ocular morbidity amongst industrial workers in Goa, India. Int J Recent Adv Multidiscip Res 2015;2:298-300.
26. Yu TS, Liu H, Hui K. A case-control study of eye injuries in the workplace in Hong Kong. Ophthalmology 2004;111:70-4.
27. Minimum wage/salary; 2023. Available from: https://wageindicator.org/salary/minimum-wage/nepal [Last accessed on 2023 Dec 02]
28. Omar R, Anan NS, Azri IA, Majumder C, Knight VF. Original research: Characteristics of eye injuries, medical cost and return-to-work status among industrial workers: A retrospective study. BMJ Open 2022;12:e048965.

How to cite this article: Patel PK, Sah SK, Adhikari PR, Karn RR. Prevalence of ocular morbidity among industrial workers of Eastern Nepal. IHOPE J Ophthalmol. 2024;3:10-5. doi: 10.25259/IHOPEJO_25_2023