"Effectiveness of Vision Screening in Detecting Visual Problems Among Industrial Workers: A Narrative Review"

Running title: Vision Screening Effectiveness in Industrial Workers

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Abstract

Industrial workers form a large, occupationally exposed population in whom uncorrected refractive error, occupational eye injury, and workplace-related ocular surface disease coexist and interact to compromise both individual health and workplace safety. This narrative review synthesizes evidence on the effectiveness of routine vision screening in detecting visual problems among manufacturing and general industrial workers, drawing on cross-sectional prevalence studies, diagnostic-accuracy evaluations, occupational injury surveillance data, and workplace eye-health programme reports from a range of countries. Across studies, screening consistently detects a substantial burden of undiagnosed or uncorrected refractive error, presbyopia, computer vision syndrome, occupational color vision impairment, and ocular surface disease among industrial workers, with prevalence estimates for any visual impairment ranging from roughly one-fifth to over half of screened populations depending on setting, age structure, and screening protocol. Comparative diagnostic-accuracy studies indicate that instrument-based and technician-led screening tools achieve high negative predictive value, making them suitable for ruling out visual impairment in large occupational cohorts, although positive predictive value declines in older or high-prevalence subgroups. Parallel surveillance data show that a large share of occupational eye injuries, particularly foreign-body injury and photokeratitis in welding, grinding, and metalworking tasks, are preventable through combined screening, hazard-specific eye protection, and safety training, yet compliance with protective eyewear remains low in many industrial settings. Underlying visual impairment appears to compound injury risk and reduce work productivity, reinforcing the rationale for periodic, job-specific vision screening as a public health and occupational safety intervention. However, considerable heterogeneity in screening protocols, outcome definitions, and reporting standards limits comparability across studies and constrains formal conclusions about programme-level effectiveness. Strengthening standardized, job-specific vision screening protocols, integrating them with existing occupational health surveillance systems, and pairing detection with accessible correction and protective-eyewear programmes are identified as

priorities for improving both the detection and the downstream impact of vision screening among industrial workers.

Keywords: vision screening; industrial workers; occupational health; refractive error; eye injuries; occupational safety

1. Introduction

Vision is central to the safe and productive performance of almost all industrial tasks, from reading gauges and blueprints to operating heavy machinery and identifying color-coded hazard signals. Globally, vision impairment affects hundreds of millions of people of working age, and the World Health Organization identifies uncorrected refractive error as the single leading cause of vision impairment worldwide [1,2]. The International Labour Organization recognizes safeguarding workers' sensory function, including vision, as a core component of occupational safety and health systems, given the direct link between sensory impairment and workplace accident risk [3].

Industrial workers face a distinctive combination of visual risk factors: prolonged near or intermediate-distance visual tasks, exposure to airborne particulates, chemical fumes, and optical radiation, and, in many low- and middle-income settings, limited prior access to eye examinations before entering the workforce. An early Indian study screening 284 industrial workers found significant visual impairment in over one-fifth of workers and moderate impairment in a further third, concluding that uncorrected refractive error frequently precedes workplace eye injury and recommending pre-placement visual acuity screening for all workers [4]. Subsequent studies across diverse industrial settings, including Iran, Turkey, India, Nepal, and Malaysia, have consistently confirmed a substantial burden of undetected refractive error, presbyopia, and other ocular morbidity among industrial workforces [5-10]. Despite this consistent signal, the effectiveness of routine vision screening as an occupational health intervention, meaning its ability to accurately detect visual problems and translate detection into improved safety and correction outcomes, has not been comprehensively synthesized. This review addresses that gap by examining evidence on the prevalence of visual problems detected through screening, the diagnostic performance of screening tools used in industrial settings, the relationship between vision and occupational injury, and the structural barriers that determine whether screening translates into corrected vision and safer workplaces.

2. Burden of Visual Impairment Detected Through Screening in Industrial Workers

Cross-sectional screening studies from multiple countries illustrate the scale of visual impairment that routine screening can uncover in industrial settings. In a large occupational medicine cohort of 2,600 male industry workers in Abhar, Iran, screening identified that 29 percent of workers had a clinically significant refractive error (20 percent myopic, 9 percent hypermetropic), with an additional 6.3 percent found to have color vision deficiency on Ishihara testing [5]. A study of 240 marble and metal workers in Afyonkarahisar, Turkey, using on-site refraction, slit-lamp examination, and Schirmer testing, found refractive error in approximately two-fifths of workers alongside substantial rates of dry eye and pterygium or pinguecula, attributing the burden to a combination of ambient dust exposure and limited prior eye-care access [6]. An eye-camp-based screening of 638 industrial workers in Noida, India, found that more than half had some detectable eye problem, with uncorrected refractive error the single most common finding, followed by presbyopia and cataract, and noted that prevalence varied by industrial sub-sector, being highest among construction workers [7]. Comparable eye-camp screening in an industrial estate in eastern Nepal similarly found high rates of ocular morbidity, with uncorrected refractive error again the leading contributor, reinforcing that this pattern is not confined to any single country or industrial sub-sector [8].

Screening in more specialized industrial cohorts reinforces these findings. A study of sugar-factory migrant workers in India documented substantial ocular morbidity linked to intense heat, dust, and glare exposure during the milling season [9], while a Malaysian study assessing visual awareness and vision problems among industrial workers in Selangor found that a considerable proportion of workers had uncorrected vision problems alongside limited knowledge of eye health and safety practices [10]. In occupations involving close, sustained near work, a longitudinal Vision in Occupational Groups Study of garment-factory workers in Hyderabad, India, found that distance vision impairment increased steeply with age, reaching an eightfold higher odds among workers aged 50 years and older, while near-vision impairment affected over half of workers aged 40 years and older before correction, falling to under seven percent once refractive correction and near addition were provided [11]. Collectively, these studies indicate that irrespective of setting, systematic screening of industrial workforces detects a visual-impairment burden that is both substantial in scale and, in the large majority of cases, correctable.

3. Diagnostic Accuracy and Performance of Screening Tools in Occupational Settings

The practical value of vision screening in industry depends on the diagnostic performance of the tools used relative to comprehensive clinical examination. Occupational vision screening commonly relies on a battery of standardized instruments, including the Snellen chart for distance visual acuity, the Jaeger card for near acuity, the Ishihara plate test for red-green color vision deficiency, and multifunction instrument screeners such as the Titmus or Optec vision testers that combine acuity, phoria, stereoacuity, and color vision assessment in a single sitting [12]. Early guidance on industrial vision screening emphasized that instrumental screeners offer good reliability and reasonably good validity for general occupational screening, but recommended that jobs with high visual demand be assessed using more detailed clinical protocols rather than screening instruments alone [13].

A diagnostic-accuracy study comparing two commercial vision screeners, the Optec 6500 and the Visiotest, against a full optometric examination as the reference standard among administrative video-display-terminal workers found that both screeners achieved acceptable false-negative rates for most tests, and that the negative predictive value of both instruments was consistently high, meaning both were effective for correctly identifying workers who did not have a given visual deficit [14]. However, positive predictive value was lower in subgroups with higher underlying prevalence of visual problems, such as workers over 50 years of age, indicating that instrument-based screening functions well as a rule-out tool for large-scale occupational surveillance, but that positive screening results, particularly in older or higher-risk workers, warrant confirmatory clinical examination rather than being treated as definitive diagnoses [14]. This distinction has direct programmatic implications: screening programmes designed primarily to identify workers requiring referral for full eye examination can rely on relatively simple, rapid instruments, provided referral pathways for positive or borderline results are in place.

4. Visual Impairment, Occupational Productivity, and Economic Burden

Beyond diagnostic detection, screening-derived prevalence data have been linked to measurable effects on work performance. In the Hyderabad garment-worker cohort described above, both distance and near vision impairment were associated with significantly higher scores on the Work Productivity and Activity Impairment questionnaire, indicating a measurable loss of on-the-job productivity among visually impaired workers relative to those with normal or corrected vision [11]. These findings are consistent with global economic modelling: the potential lost productivity attributable to uncorrected myopia and its complications has been estimated at over US$240 billion annually worldwide, while lost productivity from uncorrected refractive error more broadly has been estimated at over US$200 billion annually, figures that substantially exceed the cost of screening and correction services [15,16]. Historical estimates of the global cost of correctable blindness and vision impairment likewise concluded that investment in detection and correction services is offset many times over by averted productivity loss [17]. Although these global estimates are not industry-specific, they provide the broader economic rationale underpinning why employers and occupational health systems have increasingly incorporated vision screening into pre-placement and periodic medical examinations, alongside more direct safety motivations [12].

5. Occupational Eye Injuries: Epidemiology and the Preventive Role of Screening and Protection

A parallel and closely related body of evidence documents the burden of acute occupational eye injury in industrial settings, which vision screening and associated occupational eye-health programmes aim to prevent or mitigate. A narrative review of occupational eye injuries in the United States and internationally found that most injuries occurring in manufacturing, construction, and related sectors were foreign-body injuries or burns, frequently associated with welding or grinding tasks, and that a majority involved being struck by an airborne particle [18]. Emergency-department surveillance data indicate that a substantial share of all work-related eye injuries occur among craft and machine-operative workers in manufacturing, and that eye protection was frequently reported as absent, inappropriate, or not worn at the time of injury [19]. A study of occupational ocular trauma in southwest China found that workers without pre-work safety training or eye protection were considerably more likely to sustain occupational eye trauma than trained, protected workers, with foreign-body injury from metal particles the most common presentation [20]. Similarly, a large emergency-department-based study in a heavily industrialized province of Northern Italy found that younger workers and foreign workers experienced disproportionately higher rates of occupational eye injury, underscoring the importance of targeting screening, training, and protective-equipment provision toward higher-risk subgroups within the industrial workforce [21].

Welding-specific hazards illustrate a further, distinct pathway of preventable visual harm. Ultraviolet radiation emitted during arc welding can cause photokeratitis, an acute corneal inflammation colloquially termed welder's flash or arc eye, typically presenting within hours of unprotected or under-protected exposure [22]. A cross-sectional study of welders at an Indonesian shipbuilding facility found a high proportion of workers experiencing symptoms of acute photokeratitis, associated with inadequate use of appropriate eye protection and UV exposure exceeding recommended threshold limit values [22]. Chronic, cumulative UV exposure among welders and other outdoor or radiation-exposed workers has also been linked to longer-term ocular surface conditions, including pterygium and cataract, reinforcing the case for regular ocular surveillance in addition to injury-focused screening in this subgroup [23]. In parallel, workers in chemical and solvent-exposed industries face a distinct, sub-clinical visual hazard: occupational exposure to neurotoxic solvents and metals, including toluene, styrene, mercury, and benzene, has been repeatedly shown to impair color vision, typically along the blue-yellow axis, at exposure levels workers themselves cannot perceive and that may occur below current regulatory exposure limits [24-26]. Because this form of impairment is sub-clinical, specialized color vision testing using tools such as the Lanthony D-15 desaturated panel, rather than routine Ishihara screening alone, has been recommended as a sensitive early indicator of neurotoxic exposure in surveillance of solvent- and metal-exposed industrial workers [25].

6. Color Vision Screening and Safety-Critical Industrial Roles

Because many industrial safety systems, including electrical wiring, alarm indicators, and lockout-tagout controls, rely on color coding, color vision screening forms an important component of pre-placement and periodic occupational vision assessment in safety-critical roles. Occupational health guidance recommends a risk-assessment-based approach to color vision testing, in which the pass/fail threshold for a given role is set according to the specific colour-discrimination demands and safety consequences of that role, rather than applying a uniform standard across all industrial jobs, and describes the comparative strengths of Ishihara plate, City University, and lantern-based test methods for this purpose [27]. This risk-stratified approach reflects a broader principle relevant to all forms of industrial vision screening: screening protocols and referral thresholds should be calibrated to the specific visual demands of the job being performed, an approach formalized in visual task analysis methodologies that assess the visual acuity, color vision, and depth perception requirements of specific industrial tasks before setting screening pass/fail criteria [11,13].

7. Computer Vision Syndrome Among Industrial and Administrative Workers

As industrial workplaces have incorporated increasing amounts of screen-based monitoring, quality control, and administrative work, computer vision syndrome has emerged as an additional visual problem detectable through occupational screening. A cross-sectional study of Italian office workers using a validated computer vision syndrome questionnaire alongside objective ocular surface testing found a prevalence of 67.2 percent, with more than six hours of daily digital device use, female sex, and use of optical correction at work all independently associated with higher odds of the syndrome, and identified a measurable association between poor tear-film stability and symptomatic computer vision syndrome [28]. A related study of presbyopic video-display-terminal workers using progressive addition lenses similarly found a high burden of computer vision syndrome symptoms linked to ergonomic and lens-design factors [29]. Evidence from India, where a community-based study of computer operators using structured questionnaires and objective refraction found asthenopia, or eye strain, in the majority of screened workers, and from a study of computer vision syndrome among office workers in a developing-country setting which found broadly comparable prevalence and risk factors, indicates that this occupational visual problem is not confined to high-income settings [30,31]. A further study among healthcare workers using video display terminals reinforces that computer vision syndrome, though not sight-threatening, is a highly prevalent, screening-detectable occupational health problem with material implications for comfort and productivity across a wide range of industrial and administrative occupations [32].

8. Methodological Considerations in Evaluating Screening Effectiveness

Rigorous evaluation of vision-screening effectiveness in occupational settings requires attention to established standards for reporting diagnostic-accuracy and economic-evaluation studies, including transparent reporting of sensitivity, specificity, and predictive values relative to a clinical reference standard, and, where cost data are presented, adherence to structured reporting frameworks such as the Consolidated Health Economic Evaluation Reporting Standards [33]. The literature reviewed here is characterized by considerable heterogeneity in screening protocols, ranging from single-test Snellen screening to comprehensive multi-instrument batteries, outcome definitions, with varying visual-acuity thresholds used to define impairment, and study designs, predominantly cross-sectional, with few longitudinal or intervention studies tracking outcomes after screening. This heterogeneity limits the ability to pool findings into precise, generalizable estimates of screening sensitivity or programme-level cost-effectiveness, and mirrors a broader evidence gap identified in eye-care access research in low- and middle-income countries, where health-system and workplace-based screening coverage remains inconsistently measured and reported [34,44]. Future occupational vision-screening research would benefit from standardized outcome definitions and, where feasible, longitudinal designs that track whether screening-detected problems are subsequently corrected and whether correction measurably reduces injury rates or improves productivity.

9. From Detection to Correction: Barriers That Determine Real-World Effectiveness

As in other screening contexts, the effectiveness of industrial vision screening is ultimately constrained not only by diagnostic accuracy but by whether detected problems are corrected and whether protective measures are subsequently used. Surveys of eye-protection use among industrial and craft workers consistently find substantial gaps between hazard exposure and protective behaviour, with cost, discomfort, fogging, and low perceived risk repeatedly cited as reasons for non-use of prescribed safety eyewear, even among workers with a documented history of previous occupational eye injury [18]. Qualitative research on barriers to spectacle-wear compliance in other populations similarly identifies stigma, discomfort, and low perceived need as recurring obstacles to sustained correction, dynamics plausibly relevant to industrial workers as well, particularly where employers do not subsidize corrective eyewear or where safety glasses cannot easily accommodate a worker's prescription [42]. Workplace-based initiatives that combine on-site screening with accessible, low-cost correction, such as factory-based eye-care cafés and on-site vision centers piloted in the garment sector, have been proposed as a means of narrowing this detection-to-correction gap by removing the time, cost, and access barriers that otherwise prevent workers from acting on screening results [43].

10. Regulatory and Policy Context for Occupational Vision Screening

Several national and international frameworks formalize the role of vision screening in industrial occupational health. In the United States, regulatory standards mandate that employers provide appropriate eye and face protection wherever workers are exposed to eye-injury hazards, complementing, though not replacing, vision-screening-based hazard identification [40]. Clinical practice guidance from professional bodies recommends comprehensive, job-specific eye examinations as part of pre-placement and periodic occupational health assessment [38]. In India, factory-level occupational health obligations are established under the Factories Act, 1948, which provides the statutory basis for periodic medical examination of workers in hazardous processes, within which vision screening is typically incorporated at the discretion of individual occupational health programmes rather than through a uniformly mandated national protocol [39]. This variation in statutory specificity across jurisdictions likely contributes to the heterogeneity in screening coverage and protocol design documented throughout this review, and represents a further area where standardization could strengthen both the consistency and the measurable effectiveness of industrial vision screening programmes.

11. Limitations of the Current Evidence Base

Several limitations qualify the conclusions that can be drawn from the existing literature. Most available studies are single-site, cross-sectional prevalence surveys or eye-camp reports, providing point-in-time estimates of detected visual problems but rarely tracking whether screening led to correction, whether correction was sustained, or whether injury or productivity outcomes subsequently improved. Diagnostic-accuracy data specific to occupational screening tools remain limited to a small number of instrument-comparison studies, predominantly from high-income, office-based settings, constraining generalizability to manufacturing-floor conditions with different lighting, time constraints, and workforce literacy levels. Reporting of screening protocols and visual-impairment thresholds varies considerably across studies, complicating direct prevalence comparisons across countries and industrial sub-sectors. Finally, much of the occupational eye-injury literature is drawn from high-income-country emergency department or workers' compensation datasets, which may not capture the full burden or circumstances of injury among informally employed industrial workers in low- and middle-income settings, where underreporting is likely substantial.

12. Conclusion and Recommendations

The evidence reviewed here indicates that routine vision screening is consistently effective at detecting a substantial, largely correctable burden of visual impairment, including uncorrected refractive error, presbyopia, computer vision syndrome, occupational color vision impairment, and ocular surface disease, among industrial workers across diverse manufacturing settings and countries. Instrument-based screening tools demonstrate high negative predictive value suitable for large-scale occupational surveillance, though positive screening results, particularly among older workers, warrant confirmatory clinical examination. Screening and associated hazard-specific protective measures are further linked to the prevention of acute occupational eye injury, a substantial share of which, particularly foreign-body injuries and welding-related photokeratitis, remains preventable through improved training and consistent use of protective eyewear. On this basis, three priorities emerge for strengthening the real-world effectiveness of industrial vision screening: first, screening protocols should be standardized and calibrated to job-specific visual task demands, incorporating validated instruments and clear referral thresholds; second, screening programmes should be explicitly linked to accessible, low-cost correction and protective-eyewear provision, since detection alone does not improve safety or productivity without downstream correction and compliance; and third, occupational health systems, particularly in low- and middle-income countries where much of the global industrial workforce is concentrated, should invest in standardized surveillance and reporting of screening coverage and outcomes to build a stronger, more comparable evidence base for future policy and programme design.

References

1. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. Br J Ophthalmol. 2012;96(5):614-8.
2. World Health Organization. World Report on Vision. Geneva: World Health Organization; 2019.
3. International Labour Organization. Safety and Health at Work [Internet]. Geneva: ILO; [cited 2026 Sep 3]. Available from: https://www.ilo.org/topics/safety-and-health-work.
4. Anonymous. Visual status of industrial workers. Indian J Ophthalmol. 1990;38(2):64-5.
5. Ahadi M, Ebrahimi A, Rahmani S, Akbarzadeh Baghban A. Prevalence of refractive errors and color vision deficiency in a population of industry-workers in Abhar, Iran. Medicine (Baltimore). 2021;100(46):e27758.
6. Aktas Z, Ozturk MB, Sengor T. Ocular health among industrial workers: a prevalence study of foreign body injury, refractive error, dry eye, pterygium and pingueculae. Int Ophthalmol. 2023;43(4):1259-67.
7. Tiwari P, Jain I, Sah R, Sah MK. Visual health burden among industrial workers in Noida, India: an epidemiological study. Int J Community Med Public Health. 2025;12(6):2465-9.
8. Patel PK, Sah SK, Adhikari PR, Karn RR. Prevalence of ocular morbidity among industrial workers of Eastern Nepal. IHOPE J Ophthalmol. 2024;3(1):10-5.
9. Bangal S, Chitgopekar R, Khindria A, Pawar H. Study of ocular morbidity among migratory workers of sugar factory. Pravara Med Rev. 2011;3(3):10-5.
10. Ismail SA, Choo J. Visual awareness among industrial workers in Selangor. J Optom Eye Health Res. 2021;2(2):9-16.
11. Sharan D, Mohandoss M, Ranganathan R. Assessing vision standards for workers of the weaving industry in the Salem District of Tamil Nadu, India: a visual task analysis. Int J Occup Saf Ergon. 2025;31(3):706-16.
12. Vision in Occupational Groups Study (VOGS) collaborators. Distance and near vision impairment and its impact on work productivity among garment industry workers in Hyderabad, Telangana, India. Sci Rep. 2026;16.
13. Farhood HF, Al-Zubaidi RM. Occupational ocular health problems among marble workers at Shaq El Tho'ban industrial area in Egypt. Environ Sci Pollut Res Int. 2022;29(24):36420-9.
14. Molina-Torres MJ, Seguí-Crespo M, Tauste Francés A, Lumbreras B, Ronda-Pérez E. Diagnosis accuracy of two vision screeners for visual health surveillance of workers who use video display terminals. J Occup Health. 2016;58(5):444-51.
15. Bailey I. Vision screening in industry: objectives and methods. Aust J Optom. 1973;56(3):89-98.
16. Naidoo KS, Fricke TR, Frick KD, Jong M, Naduvilath TJ, Resnikoff S, et al. Potential

lost productivity resulting from the global burden of myopia: systematic review, meta-analysis, and modeling. Ophthalmology. 2019;126(3):338-46.
17. Smith TST, Frick KD, Holden BA, Fricke TR, Naidoo KS. Potential lost productivity resulting from the global burden of uncorrected refractive error. Bull World Health Organ. 2009;87(6):431-7.
18. Frick KD, Foster A. The magnitude and cost of global blindness: an increasing problem that can be alleviated. Am J Ophthalmol. 2003;135(4):471-6.
19. Wu AM, Wu CM, Bhatt A, Yannuzzi NA, Berrocal AM. Occupational eye injuries: patterns, epidemiology, and impact. Clin Ophthalmol. 2025;19:3805-19.
20. Xiang H, Stallones L, Chen G, Hostetler SG, Kelleher K. Work-related eye injuries treated in hospital emergency departments in the US. Am J Ind Med. 2005;48(1):57-62.
21. Long B, Yang J, Liu Y, Wang X, Wan L, Yin X. Epidemiological characteristics of work-related ocular trauma in southwest region of China. Int J Environ Res Public Health. 2015;12(8):9864-75.
22. Fea A, Bosone A, Rolle T, Grignolo FM. Work-related eye injuries: a relevant health problem. Main epidemiological data from a highly-industrialized area of Northern Italy. Int J Environ Res Public Health. 2016;13(7):658.
23. Kurniawan AF, Ma'rufi I, Sujoso ADP. Gejala fotokeratitis akut akibat radiasi sinar ultraviolet (UV) pada pekerja las di PT. PAL Indonesia Surabaya [Acute photokeratitis symptoms due to ultraviolet radiation among welders at PT. PAL Indonesia Surabaya]. J Ilmu Kesehat Masy (IKESMA). 2017;13(1):22-31.
24. Yam JCS, Kwok AKH. Ultraviolet light and ocular diseases. Int Ophthalmol. 2014;34(2):383-400.
25. Cavalleri A, Gobba F, Nicali E, Fiocchi V. Dose-related color vision impairment in toluene-exposed workers. Arch Environ Health. 2000;55(6):399-404.
26. Gobba F, Cavalleri A. Color vision impairment in workers exposed to neurotoxic chemicals. Neurotoxicology. 2003;24(4-5):693-702.
27. Lee EH, Eum KD, Cho SI, Cheong HK, Paek DM. Acquired dyschromatopsia among petrochemical industry workers exposed to benzene. Neurotoxicology. 2007;28(2):356-63.
28. Health and Safety Executive. Colour Vision Examination: Guidance for Occupational Health Providers. MS7. London: HSE Books; 2012.
29. Cantó-Sancho N, Porru S, Casati S, Ronda E, Seguí-Crespo M, Carta A. Prevalence and risk factors of computer vision syndrome-assessed in office workers by a validated questionnaire. PeerJ. 2023;11:e14937.
30. Sánchez-Brau M, Domenech-Amigot B, Brocal-Fernández F, Quesada-Rico JA, Seguí-Crespo M. Prevalence of computer vision syndrome and its relationship with ergonomic and individual factors in presbyopic VDT workers using progressive addition lenses. Int J Environ Res Public Health. 2020;17(3):1003.
31. Bhanderi DJ, Choudhary S, Doshi VG. A community-based study of asthenopia in computer operators. Indian J Ophthalmol. 2008;56(1):51-5.
32. Ranasinghe P, Wathurapatha WS, Perera YS, Lamabadusuriya DA, Kulatunga S, Jayawardana N, et al. Computer vision syndrome among computer office workers in a developing country: an evaluation of prevalence and risk factors. BMC Res Notes. 2016;9:150.
33. Artime-Ríos EM, Suárez-Sánchez A, Sánchez-Lasheras F, Seguí-Crespo M. Computer vision syndrome in healthcare

workers using video display terminals: an exploration of the risk factors. J Adv Nurs. 2022;78(7):2095-110.

34. Husereau D, Drummond M, Augustovski F, de Bekker-Grob E, Briggs AH, Carswell C, et al. Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations. Value Health. 2022;25(1):3-9.
35. World Health Organization. Report of the 2030 Targets on Effective Coverage of Eye Care. Geneva: World Health Organization; 2022.
36. McCormick I, Mactaggart I, Bastawrous A, Burton MJ, Ramke J. Effective refractive error coverage: an eye health indicator to measure progress towards universal health coverage. Ophthalmic Physiol Opt. 2020;40(1):1-5.
37. Owusu-Ansah A, Berko HSY, Amissah-Arthur KN, Mensah G, Nyame P. Oculo-visual findings among industrial mine workers at Goldfields Ghana Limited, Tarkwa. Ophthalmol Eye Dis. 2012;4:35-42.
38. National Institute for Occupational Safety and Health (NIOSH). Eye Safety at Work: Fact Sheet. Atlanta (GA): Centers for Disease Control and Prevention; 2012.
39. American Optometric Association. Comprehensive Adult Eye and Vision Examination: Evidence-Based Clinical Practice Guideline. St Louis (MO): AOA; 2015.
40. Government of India, Ministry of Labour and Employment. The Factories Act, 1948 (Act No. 63 of 1948). New Delhi: Government of India; 1948.
41. Occupational Safety and Health Administration. Eye and Face Protection: 29 CFR 1910.133. Washington (DC): US Department of Labor; 2004.
42. Ebri AE, Govender P, Naidoo K, Albert F, Shah K, Chan VF. Understanding barriers to spectacle wear compliance among schoolchildren in Calabar, Nigeria: a qualitative study. Afr J Ophthalmol Int. 2025;2(3):100160.
43. The Fred Hollows Foundation. Promoting Healthy Vision for Safety, Productivity, and Well-being in the Workplace [Internet]. Sydney: The Fred Hollows Foundation; 2023 [cited 2026 Sep 3]. Available from: https://www.hollows.org/en-HK/latest-news/the-importance-of-protecting-vision-in-the-workplace/.
44. Chan VF, Yong AC, Ramke J, Congdon N, Piyasena P, Chinai N, et al. Access to and utilisation of eye care services in low- and middle-income countries: a systematic review. Bull World Health Organ. 2023;101(6):411-25.