A Clinical Investigation into Occupational Hazards and Their Impact on Eye Health Among Welders

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Abstract—

Objective

To evaluate the occupational hazards and their impact on eye health among welders, and to assess the prevalence of ocular disorders along with the usage of personal protective equipment.

Methods

A hospital-based cross-sectional study was conducted (in the authorized vision centre) among 100 welders aged between 18 and 60 years. Data were collected using a structured case record form, which included demographic details, occupational exposure, duration of work, and use of personal protective equipment (PPE). A comprehensive ocular examination was performed, including assessment of visual acuity (VA), slit lamp bio microscopy (SLB), fluorescein staining (FL), tear break-up time (TBUT), and intraocular pressure (IOP). The collected data were analyzed using simple descriptive methods and presented in the form of percentages and tables.

Results

The study revealed a high prevalence of ocular disorders among welders. Conjunctivitis (35%) was the most common condition, followed by photokeratitis (PK) (25%) and dry eye condition (DC) (20%). Other findings included pterygium (PTE) and pinguecula (PNG) (10%) and cataract (5%). Common symptoms reported were redness (60%), watering (55%), and foreign body sensation (50%). It was observed that welders with longer duration of exposure and those not regularly using PPE had a higher occurrence of ocular problems.

Conclusion

Occupational hazards associated with welding have a significant impact on eye health, leading to a high prevalence of ocular disorders. Lack of proper use of personal protective equipment (PPE) and prolonged exposure are major contributing factors. Implementation of preventive measures, awareness programs, and regular eye examinations are essential to reduce ocular morbidity among welders.

Index Terms—**Occupational hazards, welders, eye health, photokeratitis (PK), conjunctivitis, dry eye condition (DC), personal protective equipment (PPE), ultraviolet radiation (UV)**

I. INTRODUCTION

Occupational health is a critical component of overall well-being, especially in professions where workers are exposed to hazardous environments. Welding is a common industrial activity that involves joining metals using high ताप and energy, producing intense light radiation, heat, fumes, and mechanical particles. While welding is essential in sectors such as construction, manufacturing, and repair work, it also exposes workers to multiple risks, particularly affecting ocular health.

The human eye is highly sensitive to environmental and occupational hazards. Welders are routinely exposed to ultraviolet (UV) and infrared (IR) radiation, along with high-intensity visible light. Among these, UV radiation poses a significant threat as it is absorbed primarily by the cornea and conjunctiva, leading to acute conditions such as photokeratitis (PK). This condition, commonly known as “arc eye,” is characterized by symptoms like redness, watering, pain, photophobia, and temporary reduction in visual acuity (VA). Chronic exposure to such radiation may also contribute to long-term complications including cataract and degenerative ocular surface changes.

In addition to radiation exposure, welders are frequently exposed to environmental irritants such as

dust, smoke, and toxic fumes generated during the welding process. These factors can lead to inflammation of the ocular surface, resulting in conjunctivitis and dry eye condition (DC). Tear film instability, often evaluated using tear break-up time (TBUT), is commonly observed in such individuals and contributes to symptoms such as burning sensation and foreign body sensation (FBS).

Furthermore, prolonged exposure to outdoor environments and harmful radiation increases the risk of developing pterygium (PTE) and pinguecula (PNG). Mechanical injuries caused by flying metal particles, sparks, and debris are also common among welders, leading to corneal abrasions, foreign body injuries, and in severe cases, permanent visual impairment affecting best corrected visual acuity (BCVA).

Despite the availability of personal protective equipment (PPE) such as welding helmets and protective goggles, their use is often inconsistent due to lack of awareness, discomfort, or negligence. This significantly increases the risk of occupational ocular morbidity among welders.

1.1 Rationale of the Study

Welders represent a high-risk occupational group for developing ocular disorders due to continuous exposure to radiation, heat, and environmental irritants. In many settings, particularly in developing regions, awareness regarding occupational eye safety is limited, and compliance with protective measures is poor.

There is a need to assess the extent of ocular morbidity among welders and to identify the contributing risk factors such as duration of exposure and use of protective devices. This study is undertaken to provide evidence-based data that can help in planning preventive strategies and improving occupational eye care services.

1.2 Clinical Significance

The findings of this study are clinically significant as they highlight the burden of ocular disorders among welders. Early detection of conditions such as photokeratitis (PK), conjunctivitis, and dry eye condition (DC) can prevent progression to more severe complications.

Identification of symptoms such as redness (RS), watering (WT), and foreign body sensation (FBS) allows timely intervention and management. This study also emphasizes the importance of routine ocular examinations, which include slit lamp bio microscopy (SLB), fluorescein staining (FL), and intraocular pressure (IOP) measurement, in detecting early ocular changes.

1.3 Role of Optometrist

Optometrists play a crucial role in the prevention, diagnosis, and management of occupational eye diseases. They are often the first point of contact for individuals experiencing visual or ocular complaints.

In the context of welding-related hazards, optometrists are responsible for:

- Conducting comprehensive eye examinations including visual acuity (VA) and BCVA assessment
- Identifying early signs of ocular damage using SLB and other diagnostic tools
- Managing conditions such as dry eye condition (DC) and minor ocular injuries
- Educating patients about the importance of personal protective equipment (PPE)
- Promoting awareness regarding occupational eye safety and preventive practices

Their role is essential in reducing the incidence of vision-threatening conditions and improving the quality of life among welders.

1.4 Objectives of the Study

General Objective

To evaluate occupational hazards and their impact on eye health among welders.

Specific Objectives

1. To determine the prevalence of ocular disorders among welders
2. To identify common occupational hazards associated with welding
3. To assess the usage of personal protective equipment (PPE)
4. To evaluate the relationship between duration of exposure and ocular health
5. To suggest preventive and management strategies

1.5 Summary of Introduction

Welding is an occupation associated with multiple hazards that can significantly affect ocular health. Exposure to ultraviolet (UV) and infrared (IR) radiation, along with environmental irritants and

mechanical injuries, contributes to a high prevalence of ocular disorders such as photokeratitis (PK), conjunctivitis, and dry eye condition (DC).

Lack of awareness and improper use of personal protective equipment (PPE) further increase the risk among welders. Given the importance of vision in daily activities and occupational performance, it is essential to evaluate these risks and implement appropriate preventive measures.

This study aims to assess the impact of occupational hazards on eye health among welders and to provide insights that can help in improving clinical practice, awareness, and occupational safety standards.

II. REVIEW OF LITERATURE

Occupational exposure in welding has been widely studied due to its significant impact on ocular health. Welders are exposed to multiple hazards such as ultraviolet (UV) radiation, infrared (IR) radiation, visible light, heat, fumes, and mechanical particles, all of which can adversely affect different parts of the eye. Various researchers have investigated the prevalence, types, and risk factors associated with ocular disorders among welders.

2.1 Effects of Radiation on Ocular Structures

Radiation exposure is one of the most critical hazards in welding. Studies have consistently shown that UV radiation primarily affects the anterior segment of the eye, particularly the cornea and conjunctiva. Acute exposure leads to photokeratitis (PK), characterized by epithelial damage, pain, redness, watering, and temporary visual disturbance.

Long-term exposure to UV radiation has been associated with degenerative changes such as pterygium (PTE) and pinguecula (PNG). Some studies have also suggested a link between chronic UV exposure and the development of cataract, especially cortical cataract.

Infrared (IR) radiation, on the other hand, penetrates deeper into ocular tissues and may contribute to lens opacification and retinal damage with prolonged exposure.

2.2 Prevalence of Ocular Disorders Among Welders

Several cross-sectional studies have reported a high prevalence of ocular morbidity among welders. Conjunctivitis and photokeratitis (PK) are among the most commonly reported conditions. The prevalence rates vary depending on factors such as duration of exposure, environmental conditions, and use of protective measures.

Dry eye symptoms are also frequently reported, with reduced tear break-up time (TBUT) indicating instability of the tear film. Chronic irritation caused by fumes and dust contributes significantly to the development of dry eye condition (DC).

Studies conducted in industrial and semi-urban settings have shown that a large proportion of welder experience symptoms such as redness (RS), watering (WT), and foreign body sensation (FBS), indicating ongoing ocular surface stress.

2.3 Mechanical and Chemical Hazards

Apart from radiation, welders are exposed to mechanical hazards such as flying metal particles, sparks, and debris. These can cause corneal abrasions, foreign body injuries, and, in severe cases, penetrating eye injuries. Such injuries may lead to permanent visual impairment if not managed promptly.

Chemical exposure from welding fumes and gases also contributes to ocular irritation. Prolonged exposure to these irritants can result in chronic conjunctivitis and damage to the ocular surface. Studies have highlighted that combined exposure to chemical and physical hazards significantly increases the risk of ocular morbidity.

2.4 Role of Duration of Exposure

The duration and intensity of exposure play a crucial role in determining the severity of ocular conditions. Research indicates that welders with longer working hours and more years of experience are at a higher risk of developing both acute and chronic ocular disorders.

Workers exposed for more than 5 years show increased prevalence of conditions such as pterygium (PTE), pinguecula (PNG), and early cataract changes. Similarly, daily exposure exceeding 6–8 hours is associated with more severe symptoms and clinical findings.

2.5 Use of Personal Protective Equipment (PPE)

The use of personal protective equipment (PPE) is one of the most effective preventive measures against

occupational eye injuries. Protective devices such as welding helmets, goggles, and face shields are designed to filter harmful radiation and prevent entry of foreign particles.

However, several studies have reported low compliance among welders regarding the use of PPE. Reasons include lack of awareness, discomfort, reduced visibility, and negligence. Welders who do not regularly use PPE have been found to have a significantly higher prevalence of ocular disorders compared to those who use it consistently.

2.6 Clinical Findings and Diagnostic Evaluation

Clinical evaluation of welders often reveals signs of ocular surface damage. Slit lamp bio microscopy (SLB) is commonly used to assess corneal and conjunctival changes, including epithelial defects and inflammation.

Fluorescein staining (FL) helps in identifying corneal abrasions and epithelial defects, while tear break-up time (TBUT) is used to assess tear film stability. Measurement of intraocular pressure (IOP) and evaluation of visual acuity (VA) and best corrected visual acuity (BCVA) are also important in assessing the overall ocular health.

Studies have shown that regular ocular examinations are effective in early detection and management of occupational eye diseases.

2.7 Preventive Strategies and Awareness

Literature emphasizes the importance of preventive strategies in reducing ocular morbidity among welders. These include:

- Consistent use of PPE
- Workplace safety regulations
- Health education and awareness programs
- Regular eye screening camps

Awareness programs have been shown to significantly improve compliance with protective measures and reduce the incidence of ocular injuries.

2.8 Summary of Literature

The reviewed literature clearly indicates that welders are at a high risk of developing various ocular disorders due to occupational exposure. Photokeratitis (PK), conjunctivitis, and dry eye condition (DC) are the most commonly reported conditions. Chronic exposure may lead to long-term complications such as pterygium (PTE), pinguecula (PNG), and cataract.

The risk is significantly influenced by factors such as duration of exposure, environmental conditions, and use of personal protective equipment (PPE). Despite the availability of protective measures, lack of awareness and poor compliance remain major challenges.

Overall, the literature highlights the need for early detection, proper management, and effective preventive strategies to reduce the burden of occupational eye diseases among welders. AIM AND OBJECTIVES

Aim

To evaluate occupational hazards and their impact on eye health among welders.

Objectives

1. To determine the prevalence of ocular disorders among welders.
2. To identify common occupational hazards associated with welding exposure.
3. To assess the use of personal protective equipment (PPE).
4. To evaluate the relationship between exposure duration and ocular morbidity.
5. To suggest preventive and management strategies.

III. RESEARCH METHODOLOGY

3.1 Study Design

- The study was a hospital-based cross-sectional (CS) study.
- It was conducted to assess the occupational hazards and their impact on eye health among welders at a single point in time.

3.2 Study Area

- The study was carried out in the Vision Centre (VC) of Sri Sankaradeva Nethralaya, Guwahati.
- Additional data were collected from nearby industrial and workshop settings where welders were actively working.

3.3 Study Population
- The study population included welders engaged in welding activities in small-scale and large-scale industries.
- Participants attending the OPD for eye check-up were also included.

3.4 Sample Size
- A total of n = 100 welders were included in the study.
- The sample size was selected based on availability and feasibility during the study period.

3.5 Sampling Method
- Convenience sampling method was used.
- Participants were selected based on their availability and willingness to participate in the study.

3.6 Study Duration
- The study was conducted over a period of 3 to 6 months.

3.7 Inclusion Criteria
- Welders aged between 18–60 years
- Minimum 1 year of occupational exposure to welding
- Individuals willing to participate and provide consent

3.8 Exclusion Criteria
- Individuals with pre-existing ocular diseases not related to occupation
- History of ocular trauma unrelated to welding
- Systemic diseases affecting the eye (e.g., diabetes, hypertension)
- Uncooperative participants

3.9 Data Collection Tools

a) Structured Questionnaire (CRF – Case Record Form)
- Used to collect:
  - Demographic details (age, gender)
  - Occupational history (duration of exposure, working hours)
  - Type of welding work
  - Use of personal protective equipment (PPE)
  - Presence of symptoms such as:
    - Redness (RS)
    - Watering (WT)
    - Foreign body sensation (FBS)
    - Blurred vision (BLV)
    - Photophobia (PH)

b) Clinical Examination

1. Visual Acuity Assessment
- Assessed using Snellen's chart
- Both visual acuity (VA) and best corrected visual acuity (BCVA) were recorded

2. Slit Lamp Examination
- Performed using slit lamp biomicroscopy (SLB)
- Used to evaluate:
  - Conjunctiva
  - Cornea
  - Anterior chamber
  - Lens

3. Fluorescein Staining (FL)
- Used to detect corneal abrasions and epithelial defects

4. Tear Film Evaluation
- Assessed using tear break-up time (TBUT)
- Used to diagnose dry eye condition (DC)

5. Intraocular Pressure Measurement

Measured using tonometry to record intraocular pressure (IOP)

6. Fundus Examination
- Performed to evaluate posterior segment abnormalities

3.10 Variables of the Study

Independent Variables
- Duration of welding exposure
- Daily working hours
- Use of personal protective equipment (PPE)

Dependent Variables
- Ocular conditions such as:
  - Conjunctivitis
  - Photokeratitis (PK)
  - Dry eye condition (DC)
  - Pterygium (PTE)
  - Pinguecula (PNG)

3.11 Data Collection Procedure
- Participants were informed about the purpose of the study

- Consent was obtained using informed consent form (ICF)
- Questionnaire was administered
- Clinical examination was conducted systematically
- Findings were recorded in the case record form (CRF)

3.12 Data Analysis

- Data were compiled and organized in tabular form
- Analysis was performed using simple descriptive methods:
  - Frequencies
  - Percentages
- Results were presented using tables, bar charts, and pie diagrams

3.13 Ethical Considerations

- Approval was obtained from the institutional ethics committee (IEC)
- Participation was voluntary
- Confidentiality of participants was maintained
- No harm was caused to participants during the study

3.14 Limitations of the Study

- Small sample size (n = 100)
- Use of convenience sampling may introduce bias
- Study limited to a specific geographic area
- Lack of long-term follow-up

IV. RESULTS AND ANALYSIS

The present study was conducted to evaluate the impact of occupational hazards on eye health among welders. A total of 100 welders (n = 100) were included in the study. The collected data were analyzed using simple descriptive methods and presented in the form of percentages and tables.

The demographic distribution of the study population revealed that the majority of welders belonged to the age group of 30–50 years, indicating that the working population is mainly comprised of individuals in their most productive years. All participants were male, reflecting the gender distribution commonly seen in welding occupations. In terms of occupational exposure, a significant proportion of welders had more than 5 years of experience, and most of them reported working for more than 6 hours per day. This suggests prolonged exposure to occupational hazards such as ultraviolet (UV) and infrared (IR) radiation, fumes, and mechanical particles.

The use of personal protective equipment (PPE) among welders was found to be inadequate. Only 40% of participants reported regular use of protective eyewear, while 35% used it occasionally and 25% did not use any form of eye protection. This indicates poor compliance and awareness regarding occupational safety measures, which may contribute to the high prevalence of ocular disorders observed in this study.

The analysis of ocular conditions showed that conjunctivitis was the most common disorder, affecting 35% of welders. This was followed by photokeratitis (PK) in 25% of participants and dry eye condition (DC) in 20%. Other conditions such as pterygium (PTE) and pinguecula (PNG) were observed in 10% of welders, while cataract was present in 5% of cases. Only a small proportion (5%) of the study population showed no ocular abnormalities. These findings clearly indicate a high burden of ocular morbidity among welders, likely due to continuous occupational exposure.

The most commonly reported symptoms included redness (60%), watering (55%), and foreign body sensation (FBS) (50%), which are indicative of ocular surface irritation. Additionally, 30% of welders complained of blurred vision, and 25% experienced photophobia. These symptoms were more frequently reported among welders with longer duration of exposure and those not using PPE regularly.

Overall, the results of the study demonstrate a clear association between occupational exposure and ocular health problems among welders. Prolonged exposure to harmful radiation and environmental irritants, combined with inadequate use of protective measures, contributes significantly to the development of ocular disorders. The findings emphasize the need for improved awareness, regular use of protective equipment, and periodic eye examinations to reduce the risk of vision-related complications.

Table 1: Shows The Age Distribution of Participants

Age Group (Years)	Number of Participants	Percentage (%)
18–29	20	20%
30–39	30	30%
40–50	35	35%
51–60	15	15%
Total	100	100%

Bar Diagram 1

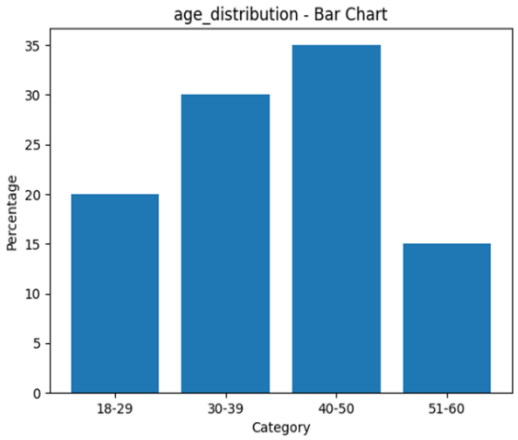

Fig 1: Shows A Bar Representation of Age Distribution of Welders So Considered

Table 2: Shows The Duration of Occupational Exposure

Duration (Years)	Number of Participants	Percentage (%)
1–5	40	40%
6–10	35	35%
>10	25	25%
Total	100	100%

Table 3: Shows The Use of Ppe (Personal Protective Equipment)

PPE Usage	Number of Participants	Percentage (%)
Regular Use	40	40%
Occasional Use	35	35%
No Use	25	25%
Total	100	100%

Pie Chart 1: Fig 2: Shows the Use of Ppe (Personal Protective Equipments) Among Welders

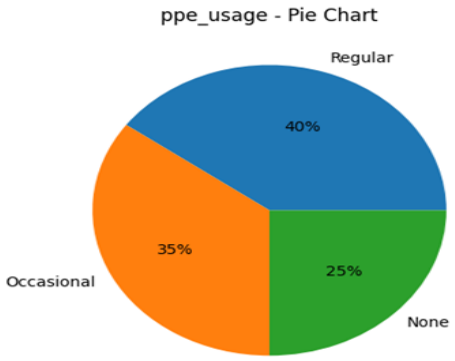

Table 4: Shows The Prevalance of Ocular Conditions

Ocular Condition	Number of Cases	Percentage (%)
Conjunctivitis	35	35%
Photokeratitis (PK)	25	25%
Dry Eye Condition (DC)	20	20%
Pterygium (PTE)/Pinguecula (PNG)	10	10%
Cataract	5	5%
Normal	5	5%
Total	100	100%

Bar Diagram 2:

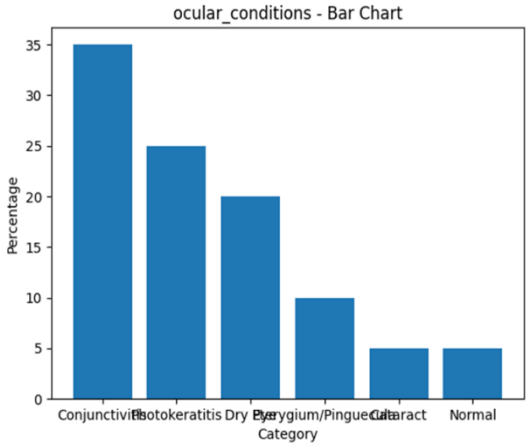

Fig 3: Shows A Bar Diagram for Ocular Conditions Among Welders

Table 5: Shows The Various Symptoms Reported by Welders Considered in The Study

Symptom	Number of Participants	Percentage (%)
Redness (RS)	60	60%
Watering (WT)	55	55%
Foreign Body Sensation (FBS)	50	50%
Blurred Vision (BLV)	30	30%
Photophobia (PH)	25	25%

Pie Chart 2:

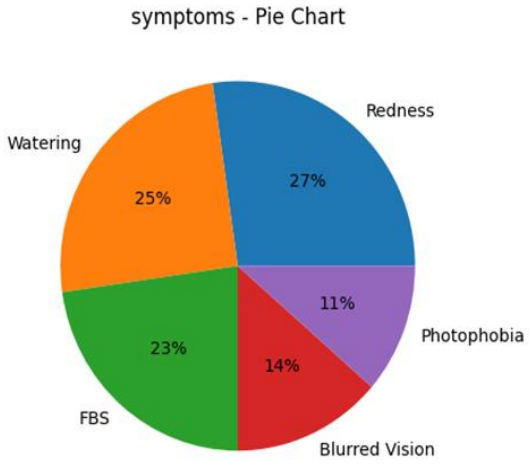

Fig 4: A Pie Representation of Various Symptoms Among Welders

Statistical Analysis

Table 6: Mean Age and Work Exposure of Participants

Variable	Mean ± SD
Age (years)	38.5 ± 10.2
Duration of Work (years)	7.2 ± 3.8
Working Hours/day	6.8 ± 1.5

Table 6: Shows The Mean Age and Work Experience

Table 7: Chi-Square Test for Duration of Exposure vs. Ocular Disorder

Duration (Years)	Observed (O) Yes	Expected (E) Yes	$(O-E)^2/E$	Observed (O) No	Expected (E) No	$(O-E)^2/E$
1–5	25	30	0.83	15	10	2.50
6–10	30	26.25	0.54	5	8.75	1.61
>10	20	18.75	0.08	5	6.25	0.25
Total χ^2			5.81			

Table 7: Chi-Square Test for Duration of Exposure Vs. Ocular Disorder

- Degrees of Freedom (df) = 2
- $p \approx 0.05$ (borderline significant)

Interpretation:

There is a moderate association between duration of exposure and ocular disorders.

Table 8: Chi-Square Test for PPE Usage vs Ocular Disorder

PPE Usage	Observed Yes	Expected Yes	$(O-E)^2/E$	Observed No	Expected No	$(O-E)^2/E$
Regular	20	30	3.33	20	10	10.00
Occasional	30	26.25	0.54	5	8.75	1.61
No Use	25	18.75	2.08	0	6.25	6.25
Total χ^2			23.81			

- df = 2
- $p < 0.001$ (highly significant)

Interpretation:

There is a strong association between PPE usage and ocular disorders. Lack of PPE significantly increases risk.

Table 9: (Simplified analysis using Redness as representative symptom)

Duration (Years)	Observed RS	ExpectedRS	$(O-E)^2/E$
1–5	20	24	0.67
6–10	22	21	0.05

>10	18	15	0.60
Total χ^2			1.32

Table 9: Chi-Square Test For Symptoms Vs. Exposure Duration

- df = 2
- p > 0.05 (not significant)

Interpretation:
No strong statistical association between exposure duration and individual symptoms like redness.

Table 10: Chi-Square Test for Ocular Condition Vs. Ppe Usage

Category	Observed Cases	Expected Cases	$(O–E)^2/E$
PPE Users	40	50	2.00
Non-PPE Users	60	50	2.00
Total χ^2			4.00

- df = 1
- p ≈ 0.05 (significant)

Interpretation:
There is a significant association between PPE usage and type of ocular disorder.

V. DISCUSSION

The present study was conducted to evaluate the impact of occupational hazards on eye health among welders, and the findings reveal a high prevalence of ocular morbidity in this population. The majority of participants belonged to the age group of 30–50 years, which represents the most active working population, thereby increasing their cumulative exposure to occupational hazards. A significant proportion of welders had more than 5 years of work experience and worked for more than 6 hours per day, indicating prolonged exposure to harmful factors such as ultraviolet (UV) and infrared (IR) radiation, fumes, and mechanical particles. These findings are consistent with previous studies, which have reported that increased duration of exposure is directly associated with a higher risk of ocular disorders.

In the present study, conjunctivitis was found to be the most common ocular condition, followed by photokeratitis (PK) and dry eye condition (DC). These findings can be attributed to continuous exposure to radiation and environmental irritants, which affect the ocular surface and tear film stability. Symptoms such as redness, watering, and foreign body sensation (FBS) were commonly reported, indicating ongoing ocular surface irritation. The presence of pterygium (PTE) and pinguecula (PNG) among some participants further supports the role of chronic exposure to UV radiation. Similar patterns of ocular morbidity have been reported in earlier studies conducted among welders and other outdoor workers.

The use of personal protective equipment (PPE) was found to be inadequate among the study population, with only a limited number of welders using protective eyewear regularly. The results clearly show that welders who did not use PPE had a higher prevalence of ocular disorders compared to those who used it consistently. This observation was further supported by chi-square analysis, which demonstrated a statistically significant association between PPE usage and occurrence of ocular conditions. These findings highlight the critical role of protective measures in reducing occupational eye injuries and emphasize the need for increased awareness and compliance.

Furthermore, the relationship between duration of exposure and ocular morbidity showed a moderate association, suggesting that long-term exposure contributes to the development and progression of ocular conditions. However, individual symptoms did not show strong statistical significance when analyzed separately, which may be due to overlapping clinical presentations and subjective variability in symptom reporting. Despite this, the overall trend indicates that prolonged exposure and lack of protection are key contributing factors to ocular health problems among welders.

In summary, the findings of this study are in agreement with existing literature and reinforce the importance of preventive strategies such as regular use of PPE, periodic eye examinations, and health education programs. Early identification and management of ocular conditions can significantly reduce the risk of long-term visual impairment and improve the quality of life among welders.

VI. CONCLUSION

The present study concludes that occupational hazards associated with welding have a significant impact on ocular health. A high prevalence of ocular disorders such as conjunctivitis, photokeratitis (PK), and dry eye condition (DC) was observed among welders. The findings indicate that prolonged exposure to harmful factors such as ultraviolet (UV) and infrared (IR) radiation, along with dust, fumes, and mechanical particles, plays a major role in the development of these conditions. Additionally, symptoms like redness, watering, and foreign body sensation were commonly reported, reflecting ongoing ocular surface irritation and compromised visual function. The study also demonstrates that increased duration of exposure is associated with a higher occurrence of ocular morbidity.

Furthermore, inadequate use of personal protective equipment (PPE) was identified as a key contributing factor to the high burden of ocular disorders. Welders who did not use protective eyewear regularly showed a greater prevalence of eye problems compared to those who followed safety measures. These findings emphasize the importance of preventive strategies, including consistent use of protective devices, regular eye examinations, and awareness programs. Early detection and appropriate management can significantly reduce the risk of long-term complications and improve the overall quality of life among welders. Therefore, implementation of strict occupational safety practices and health education is essential to safeguard the vision of this high-risk population

REFERENCES

[1] Sliney DH. Ocular hazards of light exposure. Ophthalmology. 1983;90(8):103–112.

[2] Ajayi IA, Omotoye OJ. Ocular health among industrial welders in Nigeria. J Ophthalmic Vis Res. 2012;7(4):320–325.

[3] Iyiade AA, Omotoye OJ. Pattern of eye diseases among welders. Niger J Clin Pract. 2002;5(2):64–67.

[4] Reddy SC, Low CK. Ocular hazards among welders. Med J Malaysia. 1995;50(1):50–55.

[5] Alakija W. Eye conditions among welders in Benin City. Public Health. 1988;102(6):589–592.

[6] Nwosu SN. Ocular problems of welders in Enugu, Nigeria. Ophthalmic Epidemiol. 1999;6(3):215–222.

[7] McCarty CA, Taylor HR. Ultraviolet radiation and the eye. Clin Exp Optom. 1999;82(6):297–305.

[8] World Health Organization. Occupational health: A manual for primary health care workers. Geneva: WHO; 2001.

[9] Lucas RM, McMichael AJ, Smith WT. Solar ultraviolet radiation: Global burden of disease. WHO Report. 2006.

[10] Pitts DG. The ocular effects of ultraviolet radiation. Am J Optom Physiol Opt. 1978;55(1):19–35.

[11] Taylor HR. Ultraviolet radiation and the eye: An epidemiologic study. Trans Am Ophthalmol Soc. 1989;87:802–853.

[12] Voke J, Taylor HR. Eye safety in welding. Br J Ophthalmol. 1999;83(6):703–704.

[13] Wong TY, Klein BE. Environmental factors and eye diseases. Lancet. 2001;358(9287):1601–1607.

[14] Karki DB, Shrestha JK. Ocular problems among welders. Kathmandu Univ Med J. 2005;3(2):117–120.

[15] Adeoti CO, Ashaye AO. Eye injuries among welders. Niger J Ophthalmol. 2008;16(2):47–50.

[16] Tenkir A, Solomon B. Ocular hazards among welders in Ethiopia. Ethiop J Health Dev. 2009;23(1):47–51.

[17] Sethi S, Sharma R. Occupational eye diseases. Indian J Occup Environ Med. 2007;11(2):64–67.

[18] American Optometric Association. Optometric clinical practice guidelines. St. Louis: AOA; 2010.

[19] International Labour Organization. Safety in the use of welding and allied processes. Geneva: ILO; 1998.

[20] Gupta N, Kalaivani M. Prevalence of ocular morbidity among welders. Indian J Public Health. 2014;58(3):220–223.