

PATTERN OF OCULAR INJURIES AND USE OF PROTECTIVE EYE DEVICES AMONG WELDERS

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ABSTRACT

The aim of this study was to determine the pattern of ocular injury amongst welders in Egor Local Government Area of Edo State, Nigeria. A cross-sectional study was conducted between February and June 2007, with the aid of pre-tested questionnaires. Ocular examination was performed on all subjects. A total of 271 welders comprising 220 electric welders (81.2%) and 51 gas welders (18.8%) were seen. All subjects were males. Their ages ranged from 12 to 61 years with a mean age of 27 years \pm 8.49 (SD). Among the 104 welders (38.4%) who had a history of work related ocular injury, the gas welder was more likely to have a history of work-related injury compared to the electric welder ($\chi^2 = 13.339$, $df= 1$, $p=0.000$). Superficial foreign body (78.8%) was the commonest type of injury. The agents causing injury were metal chips, welder's arc ray and sand. A total of 234 welders (86.3%) used protective eye wear while 37 (13.7%) did not use. Welders should be educated on the regular use of protective eye devices in order to prevent ocular injury.

INTRODUCTION

Ocular trauma is a significant cause of visual impairment and blindness.¹ Work-related injuries account for a substantial percentage of ocular injuries.²⁻⁵ Workers who have the highest risk of eye injuries

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include fabricators, laborers, equipment operators, repair workers, production and precision workers.⁵ More than half of work-related eye injuries occur in the manufacturing, service and construction industries.⁶ Welders belong to the construction industry. Eighty-one percent of work-related eye injuries occur in men, and mostly occur in workers 25 to 44 years of age.⁷

In Glasgow, Macewen¹ reported that 38% of new patients seen at the casualty department had ocular trauma, 69.9% of which were due to occupational injuries. In Sweden³, an epidemiological survey showed that perforating ocular injury was six times more common in men, with most

injuries (27%) occurring in the work place. Schein et al⁴ studied over 3000 patients with eye trauma and found that approximately half of the injuries (48%) occurred in the work place. Vat et al⁷ in India also observed that of the 163 episodes of ocular trauma, 54 (33.1%) were sustained in the workplace and in all cases, no protective eye device was used.

Earlier studies from Nigeria have reported work-related ocular injuries ranging from 6.6%-44% of cases with injury from chemical burns, welder's arc burns or corneal foreign bodies.⁹⁻¹¹ This was mostly due to lack of use of safety devices.

Welding processes employed in Nigeria include gas welding (by the gas welders or the panel beaters) and electric arc welding (by the electric welders). Gas welding involves the use of oxyacetylene and oxy-hydrogen flames which burn at high temperatures and emit ultraviolet radiation mostly in the UV-A region.¹² Electric arc welding requires a continuous supply of electric current which is used to create an electric arc which generates enough heat to melt metal. This also produces significant levels of ultraviolet radiation. These processes expose the welders to ocular injury from carbon arc burns and metal chips if protective eye devices are not worn.⁹⁻¹¹

This study assesses the pattern of ocular injury in the work place and the use of protective eye devices. This will provide information that will be useful for educating welders concerning work-related ocular injuries during eye health campaigns and for planning eye care programmes for welders and other occupations where people are similarly exposed to ocular hazards.

MATERIALS AND METHODS

A cross-sectional study was carried out among welders in Egor Local Government Area, Edo State, between February 2007 and June 2007. Approval for the study was obtained from the Ethics and Research Committee of the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. Consent was also obtained from the Local Government through the Primary Health Care (PHC) Coordinator (the head of the Health Department in the Local Government). Individual written consent was obtained from all participants after proper explanation of the study to them.

A pre-survey visit by the researcher showed 300 welders in the workshops. A total of 271 welders were available and were included in the study, giving a response of 90.3%. Pre-tested structured questionnaires designed for the study were administered by the authors. In each questionnaire, there were questions regarding the biodata such as the name and age, the use of protective eye device, reasons for non-use of protective eye device, the type of protective eye device used, the level of awareness of protective eye devices, type of welding, ocular history which included history of ocular trauma and ocular examination.

Visual acuity assessment was done for each eye using the Snellen's chart placed at six meters outdoors in day light. The illiterate E chart was used for those who were not educated. Each eye was tested separately with and without glasses where applicable. Anterior segment examination was carried out using the pen torch and a portable hand-held slit lamp bio-microscope. Any abnormality, sign of ongoing or previous ocular trauma or eye disease was noted. Corneal lesions were stained with 2% fluorescein dye for proper assessment.

Posterior segment examination was done using a Welch - Allen direct ophthalmoscope. Fundoscopy was initially done through undilated pupils and when necessary, dilatation was done with Gutt Phenylephrine 10% or Cyclopentolate 0.5%.

The World Health Organization's (WHO) definition of blindness and visual impairment was used.¹³ For the purpose of this study, ocular injury was defined as any injury occurring during welding, reported by the welder, which necessitated seeking medical attention or available alternatives.¹⁴

Data collated was analyzed using Statistical Package for Social Sciences (SPSS) 15. Frequency distribution tables were generated for all data collected and the data analyzed. Findings were illustrated as tables, bar charts and pie charts where appropriate. The ranges and means were determined. The statistical significance was tested using chi-square. A p value of ≤ 0.05 was regarded as significant.

RESULTS

A total of 271 welders were examined, out of which 220 (81.2%) were electric welders and 51 (18.8%) were gas welders (panel beaters). All the welders were males. The age range of the welders was between 12 to 61 years with a mean age of 27 years \pm 8.49 (SD). (Table 1)

One hundred and four (38.4%) had a history of work-related injury. The pattern of injuries included superficial foreign body in 82 welders (78.8%), corneal burns from welder's arc ray in 21 (20.2%) and penetrating injury in 1 (1.0%) (Table 2). Among the 104 welders who had a history of work-related injury, there was a statistically significant difference between

gas welders (31/51) and electric welders (73/220). The gas welder was more likely to have a history of work-related injury compared to the electric welder ($\chi^2 = 13.339$ df= 1 p= 0.000).

The age group most affected by ocular trauma in the past is seen in figure 1. They were between ages 21-30 years. They were sixty-six welders (66) accounting for 24.4% of the welders.

After sustaining injury at the work place, sixty-one (22.5%) had the foreign body removed by washing their eyes with water, twenty-seven (10%) applied eye drops obtained from the chemist, six (2.2%) did not receive treatment while two (0.7%) went to the hospital and were treated by eye specialists.

The agents causing injury were metal chips, welder's arc ray and sand. The agents implicated as causing ocular injury can be seen in table 3. These were metal chips in 59 (62%), welder's arc ray in 21 (22%), sand in 14 (15%) and battery fluid in gas welder (1%).

The total number of welders who used protective eye devices (routinely or sometimes) while working was two hundred and thirty-four (86.3%) (shown in figure 2). Of these, the electric welders who used eye devices were 216 (79.6%) while there were 18 (6.6%) gas welders. This was statistically significant showing that electric welders protect their eyes more while working compared to gas welders ($\chi^2 = 138.892$ df= 1 p= 0.000). One hundred and two welders (37.6%) used protective eye devices regularly, while one hundred and thirty-two (48.3%) did not use them all the time. Thirty-seven (13.7%) did not use any form of protective eye devices. Majority of the welders (70%) protect their eyes with sunglasses while

Table 1: Age distribution of welders

Age (years)	Electric welders		Gas welders	
	Number	%	Number	%
≤20	53	24.1	7	13.7
21-30	122	55.5	25	49.0
31-40	28	12.7	15	29.4
41-50	11	5.00	3	5.9
51-60	5	2.26	1	2.0
>60	1	0.44	0	0.0
	220	100	51	100

Table 2: Pattern of work-related ocular injury

Type of injury	Number of welders	Percent%
Superficial foreign body	82	78.8
Corneal burns	21	20.2
Penetrating injury	1	1.0
Total	104	100

Figure 1: Age group most affected by ocular trauma

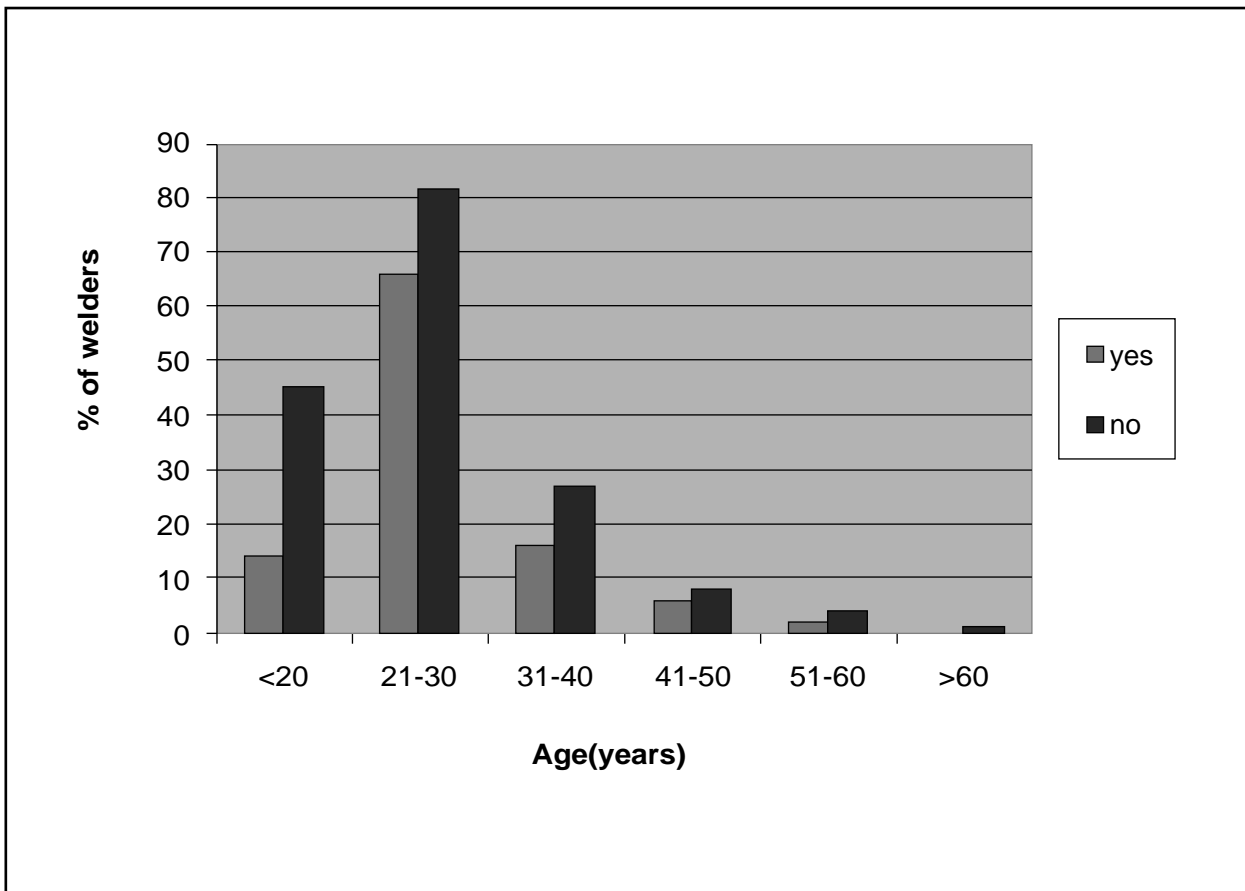


Table 3: Agents causing work-related injury

Agent	Percent%
Metal chips	62
Welder's arc ray	22
Sand	15
Battery fluid	1
Total	100

Figure 2: Number of welders who use eye device while working

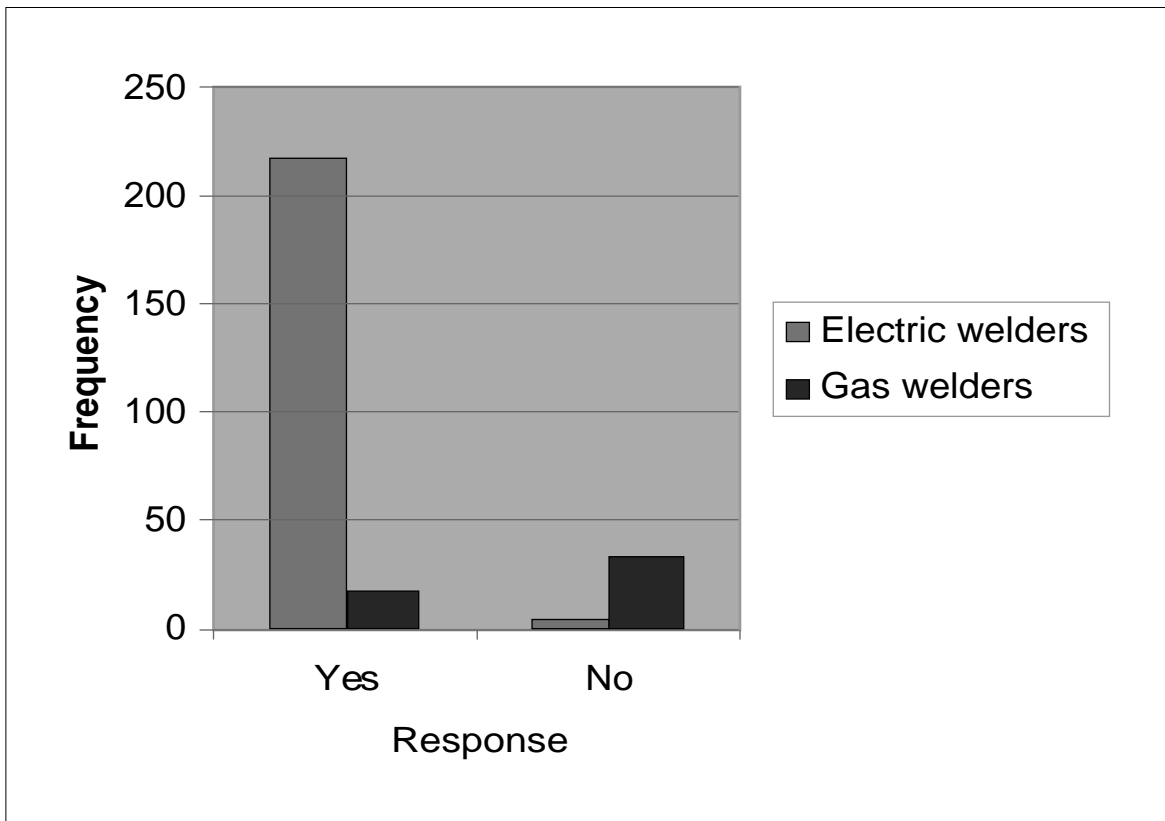


Table 4: Reasons for not using protective eye devices regularly

Reason	Number of welders	%
Not convenient	118	43.5
Unable to see work clearly	16	5.9
Did not learn with it	12	4.4
No effect on eye	8	3.0
Not necessary	5	1.8
Not available	4	1.5
Ignorant	3	1.1
No money to buy glasses	2	0.7
Total	168	61.9

the others use goggles (6%), face mask (5%) and welding glass (5%).

Table 4 shows the reasons for not using protective eye device regularly. One hundred and eighteen welders (43.5%) said it was not convenient and that it interfered with their work. Other reasons were that they were unable to see clearly with it and it was not available. Some of the gas welders (1.8%) did not think it was necessary while 3% didn't think exposure of their eyes to the flame of oxy-acetylene gas had any effect on their eyes.

DISCUSSION

The prevalence of ocular trauma in this study was 38.4% and the age group most affected was 21-30 years. Superficial foreign body was the commonest cause of work-related ocular injury which agrees with previous studies by Umeh⁹ and Edema et al.¹⁵ This could be attributed to the fact that welders work with metals and in the process of beating them into the desired shape, metal chips can enter the eye. This is however in contrast with Okoye¹¹ who found blunt injury to be the commonest. About 32.5% of the welders saw the presence of a superficial foreign body as a minor condition which could be taken care of by washing the face with water or by using eye drops. Therefore they did not see the need to report for treatment. Self-medication was seen among 10% of the welders.

The causative agents of ocular trauma in this study were metal chips (62.0%), welder's arc ray (22.0%), sand (15.0%) and battery fluid (1.0%). This is similar to the report by Okoye¹¹ where metal chips and welder's arc rays were among the main causative agents, but differs from the finding by Edema et al¹⁵ on industrial workers, where sand dust was found to be

the commonest agent. This is expected in this study since majority of the welders studied (81.2%) were exposed to flying metal chips and arc ray.

It was observed that most gas welders (panel beaters) did not see the need to use protective eye devices, but still had metal particles and sand entering their eyes. One case with adherent leukoma did not know he had an ocular problem. He belonged to the gas welder group. Majority of these felt they could not see clearly through the eye devices while working.

One hundred and two welders (37.6%) used protective eye devices regularly while one hundred and thirty-two (48.7%) did not use protective eye devices regularly. The other welders, who were mostly gas welders (13.7%), did not see the need to use protective eye devices at all. The number of welders who used eye device regularly in this study was low compared to Alakija's¹⁶ study where 65% reported regular use of goggles. However, the number of welders aware of the protective property of goggles in this study was high (74.5%). The level of use of eye device in this study is higher when compared to the study in Owo, where only 17.5% wore goggles always, despite being aware of their protective property.¹⁷ This highlights the need to institute policies on the regular use of protective eye devices in the work place and ensure that these policies are implemented.

In a survey of the eye safety practices among welders in Lagos State, 43.7% of the welders wore goggles, 45.4% used sunglasses while 10.9% did not use any device.¹⁸ In this study, only 6% of the welders wore goggles which is very low. Most of the workers (70%) used sunglasses. Some of these sunglasses have ultraviolet

blocking properties. In a study in Baltimore Maryland,¹⁹ sunglasses were found to reduce the exposure of the eyes to ultraviolet radiation. The protective effect was better in sunglasses whose size and shape excluded light reaching the eyes through the sides, top, and bottom of the frames.

In Banerjee's²⁰ study, sixty-five (39.6%) out of the one hundred and sixty-four patients with intraocular foreign body resulting from work-related injuries, did not use protective eye devices while working. Fong²¹ has also shown that eye injuries are frequent when protective eye devices are not used and are highly preventable by using the correct safety wear.

In this study, various reasons were given for not wearing protective eye devices. These included that the goggles were too thick and interfered with visibility therefore impairing the welder's ability to do his work effectively. This reason was given by the welders who preferred sunglasses and the gas welders who did not use protective eye devices. Some said the devices were unavailable as they did not know where to buy them while others did not have the money to buy them. Others felt they were not convenient especially when they had to hold the face shield while working, which normally they ought to have strapped to their head. The gas welders were either ignorant of their use or did not feel they were necessary for their work and didn't think exposure of their eyes to the flame of oxy-acetylene gas had any effect on their eyes. Few said they did not learn to use them when they were training and therefore could not use them while working. These reasons were similar to reasons given in Okoye's¹¹ and Alakija's studies.¹⁶

There is a need for increased awareness and use of protective eye devices among welders to prevent ocular injury from burns, ultraviolet radiation and flying particles. These protective eye devices include polycarbonate spectacle lenses with side shield, goggles and face shield with visors.²²

In conclusion, there is a high prevalence of work-related ocular injuries among welders. It is important to recognize conditions in the work pattern of welders which predispose them to injuries; such as lack of use of protective eye devices and institute safety policies to prevent injuries from occurring amongst these.

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