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Awareness and utilization of protective eye device among welders in a southwestern Nigeria community

Iyiade A. Ajayi, Adenike O. Adeoye¹, Charles O. Bekibebe², Oluwatoyin H. Onakpoya¹, O. J. Omotoye

Department of Ophthalmology, University Teaching Hospital, Ado-Ekiti, ¹Ophthalmology Unit, Department of Surgery, Obafemi Awolowo University, Ile-Ife, ²Department of Ophthalmology, University College Hospital Ibadan, Nigeria

Correspondence to: Dr. Iyiade Adeseye Ajayi, Department of Ophthalmology, University Teaching Hospital, PMB 5355 Ado-Ekiti, Nigeria. E-mail: iyiseye2005@yahoo.com

Abstract

Objective: To determine the level of awareness and practice of use of protective eye devices among welders in Ile-Ife. **Methods:** This is a cross-sectional descriptive study of 405 consenting welders. A pretested proforma was utilized to obtain information on sociodemographic characteristics, as well as awareness and use of protective eye device.

Results: The age of the respondents ranged from 16 to 80 years. The mean age was 39 ± 13 years. A large proportion (315, 78%) of the welders was aged between 21 and 50 years. The youngest group aged ≤ 20 years accounted for 15 (4%) of all welders, while the oldest group aged > 60 years accounted for 21 (5.2%). 402 were males (99.3%) and three were females (0.7%). Three hundred thirty-six (83%) of the welders had practiced for 6 years and above. There was a high level of awareness of protective eye devices among the welders (367, 90.6%), being higher among arc welders compared with gas welders ($P < 0.001$). Less than half (186, 45.9%) of the welders possessed protective eye devices. Of these, only 39 (9.6%) made use of the devices always. Some of the reasons for not using the protective eye devices include discomfort and poor visibility (56, 13.6%) and inadequate appreciation of the necessity to wear it (49, 12.1%).

Conclusion: The findings of this study suggest that a significant proportion of welders in Ile-Ife were not utilizing protective eye device. Health education and awareness campaigns about the importance and benefits of utilizing protective eye devices are recommended.

Keywords: Nigeria, protective eye device, welders

Résumé

Objectif: Pour déterminer le niveau de sensibilisation et de la pratique de l'utilisation des dispositifs de protection oculaire chez les soudeurs en Ile-Ife.

Méthodes: Il s'agit d'une étude descriptive transversale de 405 soudeurs consentants. Un pré-testés pro forma a été utilisé pour obtenir information sur les caractéristiques sociodémographiques, ainsi que sensibilisation et utilisation du dispositif de protection oculaire.

Résultats: L'âge des répondants varie entre 16 et 80 ans. L'âge moyen était de 39 ± 13 ans. Une grande proportion (315, 78%) des soudeurs était âgé entre 21 et 50 ans. Le groupe le plus jeune âgés de ≤ 20 ans représentés 15 (4%) de tous les soudeurs, tandis que le groupe le plus âgé de > 60 ans représentaient 21 (5,2%). 402 hommes (99,3%) et trois étaient des femelles (0,7%). Trois cent trente - six (83%) des soudeurs a pratiqué pendant 6 ans et plus. Il y avait un haut niveau de sensibilisation des dispositifs de protection oculaire parmi les soudeurs (367, 90,6%), étant plus élevé chez les soudeurs arc comparée à soudeurs de gaz ($P < 0,001$). Moins de la moitié (186, 45,9%) des

soudeurs possédaient des dispositifs de protection oculaire. De ces, seulement 39 (9,6%) fait utiliser des dispositifs de toujours. Quelques-unes des raisons pour ne pas utiliser les dispositifs de protection oculaire comprennent un inconfort et la mauvaise visibilité (56, 13,6%) et l'appréciation inadéquate de la nécessité de le porter (49, 12,1%).

Conclusion: Les conclusions de cette étude suggèrent qu'une proportion importante des soudeurs en Ile-Ife ne étaient pas utilisant le dispositif de protection oculaire. Campagnes de sensibilisation et d'éducation santé sur l'importance et les avantages de l'utilisation des dispositifs de protection oculaire sont recommandés.

Mots clés: Nigeria, dispositif de protection oculaire, soudeurs

Introduction

Welding is the most effective means of permanently joining metals. Though there are about 60 different methods of welding, gas and arc welding are the types commonly practiced in the developing countries. The use of protective eyewear while welding helps to reduce harmful effects of ultraviolet (UV), visible, and infrared radiation.^[1] It provides mechanical protection for the eye from weld splatter and reduces the visible light to a comfortable level to improve visibility in the welding zone.^[1] All welding processes produce radiation in the UV, visible, and infrared spectra.^[1] Welders have been identified as a high-risk group for occupation-related eye injuries^[2] and eye disorders due to their exposure to UV radiation.^[3]

The medical and safety problems associated with welding include skin burns, fume inhalation, electric shock, overheating, injuries resulting from explosion of fire, actinic keratitis (welder's flash), ocular foreign bodies, and death.^[1]

Thermal retinal damage can also occur from near infrared radiation.^[4] Ajaiyoba and Scott^[2] in Ibadan, in a study of the risk factors associated with eye diseases, reported that Welders and Panel beaters among others were particularly at risk of ocular injuries with potential for blindness. Abiose and Otache,^[3] in 1981 in an ophthalmic survey of 3 676 industrial workers in Kaduna, Nigeria, noted that welders are especially at risk of radiation dangers, while a high prevalence of ocular morbidity was observed among welders in Benin city by Alakija.^[5] Pterygium (11%), conjunctivitis (10.5%), and lacrimation (12.5%) were the commonest eye disorders reported among the welders in Benin city.^[5] The mainstay of ocular protection from welding arc radiation is filter placed within the welder's helmet. Historically, these filters have been made of infrared absorbing green glass.^[6]

Work-related eye injuries constitute a public health problem being responsible for significant morbidity.^[7] Many eye injuries may be of a minor nature; serious injuries may occur and even injuries of a minor nature can have significant consequence, without appropriate care.^[7] Eye injuries account

for a substantial proportion of all work-related injuries.^[8,9] They are considered to be largely preventable, especially if adequate eye protection is used and appropriate machine guards are positioned over obvious hazards.^[10] Welding is one of the tasks with highest risk of eye injuries. Welders also engage in high risk activities like cutting, filing, chiseling, and hammering further increasing the risk of occupational eye injuries resulting from flying particles, fragments, and sparks.^[11] A survey of eye safety practices among welders conducted in Lagos reported that less than half (43.7%) of the welders studied used welding goggles when welding. Another 45.4% used sun glasses, while others did not use any device, revealing that a large proportion of welders do not take adequate precautions to protect their eyes from hazards associated with welding.^[12] A similar survey in a province in Thailand showed that all subjects used protective devices, with varying levels of correct use.^[12]

The gains of protective eye device use cannot be underestimated. This study was carried out to determine the level of awareness and practice of use of protective eye devices among welders in Ile-Ife, Nigeria.

Materials and Methods

Practicing welders in Ile-Ife, Osun State of southwestern Nigeria, were the subjects. Ethical clearance was obtained from the Ethics and Research Committee of the OAUTHC Ile-Ife. Consent was obtained from the leader of the Association of Welders in Ile-Ife. Verbal consent was obtained from each respondent in the field.

The welders' association in Ile-Ife is organized and divided into nine regional zones depending on the location of their workshops. Each zone has between 50 and 60 registered welders, giving a total of 486 welders.

All the welders in Ile-Ife were included in the study to take care of nonresponse.

A questionnaire was administered to each respondent by face-to-face interview after explaining the

procedure and the need to conduct the study. The interview was conducted in English language, with language translation into Yoruba when necessary.

The interview elicited information on the following: Personal data, Welding history, Social history, and Ocular history.

Exclusion criteria

Nonconsenting respondents were excluded.

Data management

Data were recorded and all statistical analyses were performed with commercially available computer program, Statistical Package for Social Science (SPSS) version 13.0. Data are expressed as Mean \pm Standard Deviation and frequency expressed as a percentage. The relationships between categorical data were analyzed using Chi-square (χ^2) test. At the adopted confidence level of 95%, P value of 0.05 (i.e., 5%) or less was considered to be significant. Yates's corrected Chi-square and the appropriate Fisher's exact P value were used where the value of any cell was less than 5.

Results

The age of the respondents ranged from 16 to 80 years. The mean age was 39 ± 13 years. Figure 1 shows that 315 (78%) of the welders were aged between 21 and 50 years. The youngest group of workers aged ≤ 20 years accounted for 15 (4%) of all welders, while the oldest group aged >60 years accounted for 21 (5.2%).

Duration of practice of welding

Three hundred thirty-six (83%) of the welders had practiced for 6 years and above, least duration was 1 year and mean was 17.36 ± 12.05 years [Table 1].

Type of welding process

Two hundred seventy-five (67.9%) of the respondents were arc welders only, 91 (22.5%) were gas welders

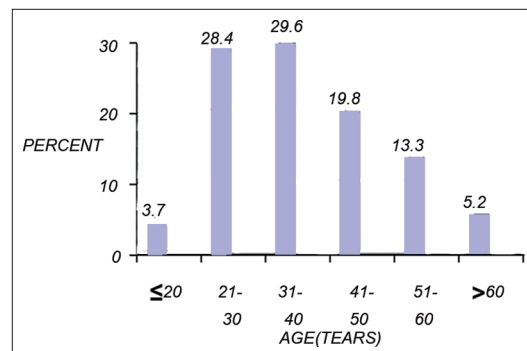


Figure 1: Age distribution of welders

only (panel beaters), while 39 (9.6%) utilized both arc and gas welding techniques [Figure 2].

A total of 385 (95.1%) welders had formal education at varying levels. Only 4.9% had no formal education [Table 2].

Work-related eye injuries

One hundred eighty-six of all the welders (45.9%) had history of previous eye injuries sustained at work. These ranged from superficial foreign bodies in 185 (45.6%) welders to severe eye injury necessitating enucleation in one (0.3%) of the respondents. Two hundred nineteen (54.1%) welders had never sustained work-related eye injuries.

Knowledge of protective eye device

Three hundred sixty-seven (90.6%) of the welders had knowledge of protective eye devices [Figure 3]. There was significant relationship between level of education and knowledge of protective eye device (χ^2 value = 19.22; $P < 0.001$). The level of knowledge was highest with those who had primary education and lowest with those with tertiary education. Ninety five percent of those who had no formal education had knowledge of protective eye device,

Table 1: Duration of practice of welding

Duration in years	Frequency n (%)
1-5	69 (17.0)
6-10	90 (22.3)
11-15	63 (15.5)
16-20	46 (11.4)
21-25	35 (8.6)
26-30	40 (9.9)
31-35	34 (8.4)
>35	28 (6.9)
Total	405 (100)

Table 2: Educational status

Level of education	Frequency n (%) Welders
No formal education	20 (4.9)
Primary	116 (28.6)
Secondary	260 (64.2)
Tertiary	9 (2.2)
Total	405 (100)

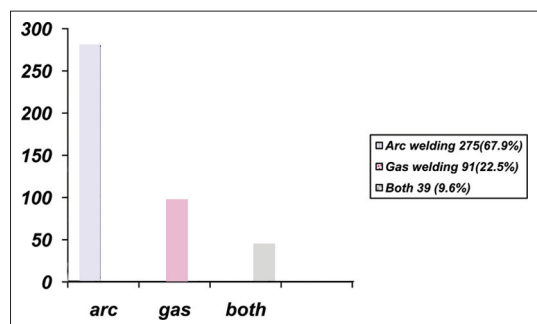


Figure 2: Type of welding process employed

while this was the case in 97%, 89%, and 56% of those who had primary, secondary, and tertiary level of education, respectively.

Despite the high awareness level, only 186 (45.9%) possessed this device, of which 155 (83.3%) actually made use of their protective device. This translates to 38.3% of the study population who made use of protective eye device [Figure 4].

Frequency of use of protective eye device

Only 39 (25.2%) welders used their protective devices always. One hundred sixteen (74.8%) used them sometimes [Table 3].

Reasons for nonuse of protective eye device

The reasons for nonuse of protective eye device are as shown in Table 4. Among the 250 welders who did not use protective eye device, 22.4% were not using them because of the discomfort experienced during use. Only 5 (2%) complained about the non-affordability of the protective eye device.

Relationship between type of welding and knowledge of welders' protective device

There is a significant higher level of knowledge of protective eye device among the arc welders (95.6%) when compared with gas welders (71.4%); Odds ratio = 8.767 (95% CI, 4.200-18.300), as shown in Table 5.

The arc welders are eight times more likely to be aware of protective eye devices when compared with the gas welders.

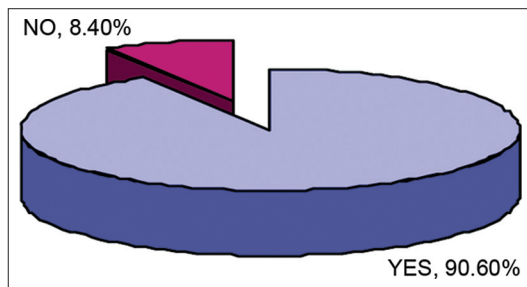


Figure 3: Knowledge of protective eye device

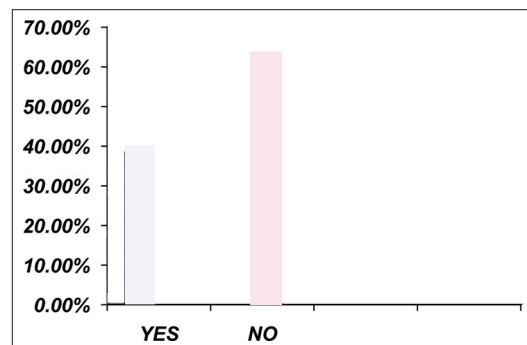


Figure 4: Use of protective eye device

Relationship between type of welding and possession of protective eye device

As shown in Table 6, a higher percentage of the arc welders possessed protective eye device (49.8%), compared with 30.8% of the gas welders; Odds ratio = 2.234 (95% CI, 1.349-3.698). There is a higher rate of possession of protective eye spectacles among the arc welders than the gas welders.

Relationship between frequency of use of protective eye device and previous eye injury

There was a significant relationship between the occurrence of previous eye injury and the frequency of use of protective eye devices. Eleven (35.5%) of the 31 welders who never used protective eye device had previous work-related eye injury [Table 7]. The occurrence of eye injury in those who wear protective device always could be as a result of recall bias, donning of protective eye device, or injury at other activities like grinding or hammering or milder forms of potentially more damaging injuries.

Table 3: Frequency of use of protective eye device

Frequency of use	Number (n)	Percentage
Sometimes	116	(74.8)
Always	39	(25.2)
Total	155	(100)

Table 4: Reasons for non-use of protective eye device

Reason	Number = 250 (%)
No specific reason	67 (26.8)
Discomfort	56 (22.4)
Belief of its dispensability	49 (19.6)
Not available in the market	47 (18.8)
Difficulty to use without assistance	34 (13.6)
Non-affordability	5 (2)

Table 5: Knowledge of welders protective eye device and type of welding process employed

Knowledge	Arc welding	Gas welding
Yes n (%)	263 (95.6)	65 (71.4)
No n (%)	12 (4.4)	26 (28.6)

$\chi^2=43.063$; $df=1$; $P<0.001$; Odds ratio = 8.767 (95% CI, 4.200-18.300)

Table 6: Type of welding process employed and possession of protective eye device

Possession of protective eye device	Arc welding	Gas welding
Yes n (%)	137 (49.8)	28 (30.8)
No n (%)	138 (58.2)	63 (69.2)

$\chi^2=10.021$; $df=1$; $P=0.001$; Odds ratio = 2.234 (95% CI, 1.349-3.698)

Discussion

Three hundred sixty-seven (90.6%) of the welders were aware of the existence of protective eye devices which should be used while welding. This was quite high and compares favorably with a 100% awareness level reported by Omolase and Mahmoud,^[13] in Ondo state, Nigeria. A statistically significant lower level of awareness was noted among the gas welders who believed that there was a greater need for protective eye devices among arc welders. It has been observed that people may choose not to wear their protective devices even when they are aware of their vulnerability and the dangers of such actions.^[14] Even though 45.9% of the respondents possessed protective eye devices, only 38.3% of the welders utilized them. This reveals a low level of utilization of protective eye devices among welders in Ile-Ife. This finding is similar to those of Oduntan^[15] (43.7%) and Omolase and Mahmoud^[13] (17.5%) in Lagos and Ondo states, respectively, but contrary to the 100% level of utilization among welders in Thailand.^[12]

It was generally observed that welders in Calabar, Nigeria, did not always wear their protective goggles during welding; human behavior is complicated and is often affected by sociocultural factors apart from awareness.^[16]

A statistically significant lower level of utilization of protective eye devices among the gas welders compared with the arc welders was noted in this study. This may be related to the lower level of awareness about protective eye devices among the former.

It is worrisome that only 9.6% of the welders used their protective devices always, 132 (32.6%) used them average of seven times of every 10 times of welding. The reasons for nonuse included inadequate appreciation of the necessity to constantly wear the goggles during every welding procedure, discomfort, poor visibility especially when working in confined and poorly lit spaces, nonavailability in the markets, and difficulty of use without assistance. These reasons are similar to those reported by Omolase and Mahmoud.^[13]

Table 7: Relationship between frequency of use of protective eye device and previous eye injury

Frequency of use of protective eye glasses	Previous ocular injury	
	Yes n (%)	No n (%)
Never	11 (35.5)	20 (64.5)
Sometimes	46 (39.7)	70 (60.3)
Always	28 (71.8)	11 (28.2)

$P < 0.001$; Chi value = 18.325

Eye injuries have been considered to be largely preventable, especially if adequate eye protection is used and appropriate machine guards are positioned over obvious hazards.^[10]

It is not impossible that the fact that it is not used by male colleagues could have played a salient role in the low level of utilization of these devices.^[17] This drives home the point that there is still a need for continuous education as well as provision of acceptable and easy-to-use devices which leave both hands free and allow clear visibility for the welders.^[17]

The low level of utilization of protective eye devices by welders was found to be associated with a significantly higher level of work-related eye injuries among the welders in this study. Close to half of them reported previous ocular injuries, which necessitated surgery in 7.9% of the welders. Alakija^[5] observed in his study a greater likelihood of occurrence of eye problems among welders who did not use their protective spectacles.

Studies in different parts of Nigeria have revealed a low level of utilization of protective eye devices not only among welders, but industrial workers as a whole. Abiose and Otache^[3] noted the failure to wear protective eye devices in Kaduna despite the fact that they had been provided. Okoye and Umeh^[18] in Southeastern Nigeria also reported a low level of use of protective eye cover while at work.^[18] Similar observations were made by Oduntan,^[15] Omolase,^[13] and Ademola-Popoola *et al.*^[17] in the southwestern parts of Nigeria. In an Australian study, the welders demonstrated high levels of discomfort symptoms which were correlated with the length of unprotected exposure to nearby welding.^[19] Considering the risks associated with failure to use protective eye devices among welders, a greater awareness should be created among the welders on the need to procure protective eye goggles and the regular wear of these goggles for all welding, grinding, and hammering activities.

Conclusion

The findings of this study suggest that a significant proportion of the welders in Ile-Ife are not utilizing their protective eye device. Health education and awareness campaigns about the importance and benefits of utilizing protective eye devices are recommended.

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