

## Original Article

# Assessment of Awareness of Occupational Health Problems, and the Practices of Safety Measures among Welders in a Semi-Urban Town in South-South Nigeria

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## ABSTRACT

Welders are exposed to a variety of occupational hazards with untoward health effects. However, little is known of welders' awareness and knowledge of occupational health hazards, and their practices of safety measures to reduce the occurrence of preventable hazards in their workplaces. This study assessed the awareness of occupational hazards and practice of safety measures among welders in a sub-urban community in South-South, Nigeria. A structured questionnaire was administered to 58 welders in Ekpoma Edo State, Nigeria. Information was sought on their socio-demographic characteristics, their awareness of occupational hazards and practice of safety measures. Their workshops were inspected for the availability and the expiring date of fire extinguishers. Data were analyzed using statistical package for social sciences (SPSS) version 21. Chi-square test and Fisher Exact test were used to test for significance at a p-value of <0.05. All the welders were aware of one or more workplace health problems. There was a statically significant association with the type of welding flame used. The frequently used protective equipment were safety goggles (81%), insulated safety gloves (56.9%) and work suits/coverall (50%). The level of awareness of occupational hazards was high, with sub-optimal utilization of protective measures against the hazards. There is, therefore, the need for health and safety education for these workers for their health promotion and the reduction in exposure to harm in the workplace and the increase of productivity.

**Keywords:** Awareness, Occupational hazards, Safety Measures, South-South Nigeria, Welders.

## INTRODUCTION

Occupational health aims at the promotion and maintenance of the highest degree of physical, mental, and social well-being of workers in all occupations.<sup>1</sup> In many developing countries, welding has become one of the most important occupational group,

owing to rapid urbanization and industrialization of many communities and towns.<sup>2</sup> In Nigeria, it is common place for welding to be learnt as a trade in an informal setting rather than a formal school setting. The informal sector contributes significantly to the economic development of the country. The operators of this sector are artisans with mainly primary education and sometimes no formal

education at all.<sup>3</sup> The International Standard Classification of Occupations (ISCO) defines welders as workers who join and cut metal parts using flame or electric arc and other sources of heat. Irrespective of the type of heat used, the workers get exposed to a range of hazards during the welding process. Welding poses a range of both well-known and indirect hazards to health and safety.<sup>4</sup>

Hazards affecting welders can be classified into physical, chemical, mechanical, and ergonomic. Physical hazards are hazards that cause physical damage or injury, and it includes exposure to noise, vibration, radiation (ionizing and laser), or excesses of heat, cold, and physical trauma.<sup>5</sup>

The excessively high temperature generated by the hot oxyacetylene flame or the electric current may lead to burns and electric shocks. Injuries such as lacerations and cuts by sharps or pointed metal panes, from high-velocity particles and occasional explosions of the oxyacetylene gas tanks, may also occur. It has been further opined that welding machines produce vibrations which may give rise to soft tissue injury and injury to the digital circulation of the hand and arm resulting in a condition known as Hand-Arm Vibration Syndrome (HAVS) which has symptoms similar to that of Reynaud's Syndrome i.e. blanching of the fingers.<sup>6</sup> It has been stated that sound levels as high as 120 decibels (dB) is produced by the welding machine, which is very dangerous to the unprotected hearing organ. Exposure to high levels of noise (>90dB) for eight hours or more is likely to cause noise-induced hearing loss (NIHL), which results in damage to the sensory hair cells of the cochlea causing permanent threshold shift or deafness. Chemical hazards, on the other hand, refer to the deleterious effects the chemical component of welding materials that welders are exposed to daily.<sup>7</sup> These include exposure to noxious metal fumes containing a cocktail of metals like zinc, copper, cobalt, nickel, chromium, platinum, and their oxides leading to various respiratory dysfunctions and the influenza-like condition known as metal fume fever.<sup>7</sup> According to the International Health and Safety Association, safe work practices are generally written methods outlining how to perform a task with minimum risk to people, equipment, materials, environment, and processes.<sup>8</sup> While it is unlikely that small holder welding practitioners will have such level of organization, some practices that can prevent hazards among welders include good housekeeping, use of personal protective equipment, availability of first aid, and protection against hot surfaces.<sup>4</sup>

A cross-sectional descriptive study carried out in Lahore, Pakistan, in 2017 to assess the level of awareness regarding occupational health hazards among 70 welders found out

that 45.7% of the respondents said that there is no major risk to their health in the welding profession.<sup>9</sup> On the contrary, a similar studies on awareness of occupational hazards among welders in Eastern Nepal in 2011, India in 2017, Lideta Sub-City Ethiopia in 2015, Tigray region of Ethiopia in 2013, and on awareness of occupational injuries in Coastal South India in 2013, revealed much higher levels of awareness of 90.7%, 62.6%, 86.5%, 51.9%, and 83.3% respectively.<sup>10-14</sup> Studies regarding safety measures revealed different findings from one group to another. For instance, in the studies carried out in Eastern Nepal in 2011, and in Ethiopia in 2013 showed that 90% of the welders were aware of at least one kind of PPE while as high as 84.6% had knowledge of accident prevention.<sup>9,15</sup>

Conversely, the practice of these safety measures has been seen to be abysmally low compared to the knowledge levels revealed from the aforementioned studies. For example, in the studies that examined the use of safety measures among welders, that of Eastern Nepal in 2011, only 47.7% of these welders used at least one kind of PPE during work and none of the welders used welding mask, instead, cotton mask was used by 45% of them despite being aware of welding masks.<sup>10</sup> A study carried out in Lahore, Pakistan, in 2017 to determine the utilization of PPE similarly, face masks were used by 14.3% (4.3% regularly and 7.1% occasionally), helmets by 8.6% (4.3% regularly and 4.3% occasionally), and 1.4% used ear muffs occasionally.<sup>9</sup> Similarly, in the Coastal South India study, amidst the high variability in usage of PPEs, boots was worn by only 4 (1.9%) for 4-7 days in the preceding week and none of them had apron and air filter.<sup>12</sup>

In Nigeria, a study carried out in Osogbo, Osun State, it was revealed that though 79.1% of the respondents were trained to make use of safety devices during welding, 20 (18.2%) were reported not to be using any form of protective equipment while others used one form or the other at different times during work.<sup>13</sup> Generally, previous studies have revealed poor utilization of safety materials by welders. However, the specific devices commonly used by these workers and their level of compliances with the use of relevant PPE were not mentioned by the researchers in these previous studies and therefore there seems to be a gap that requires some researches to be carried out on. This study aimed to assess the awareness of occupational hazards and the practice of specific safety measures in the prevention of occupational injuries with the view of making recommendations for ameliorating the effect of the hazards and improving the health of artisans in the welding occupation.

## MATERIALS AND METHODS

The study was carried out in Ekpoma town, Esan West Local Government Area, Edo State. Ekpoma, is the administrative headquarters of Esan West Local Government Area. It houses one of the Edo State Government owned universities, Ambrose Alli University, Ekpoma. It also plays host to several medium and micro-businesses and artisans' workshops. Among the various categories of artisans in Ekpoma, welders constitute a significant number after the automobile artisans. All cadres of welders were included in the study. These welders commonly practice their occupation in makeshift stalls by the roadside. They are organized under the Ekpoma Technician Association (ETA) and regulated by the Local Government Authority. The Local Government Area has a total of 40 registered welding workshops with the number of workers in each workshop ranging from 1 to 4.

A total of 58 consenting welders were recruited for the study who were from 30 workshops that were opened and operational during the study. Data was collected from respondents in their workshops between September and mid-November 2019. The questionnaire used for the data collection was designed by the researcher after a pretesting that was carried out among ten welders in Irrua, Esan Central LGA and instrument validation by two occupational health experts. The structured questionnaire was on the socio-demographic characteristics, awareness of occupational hazards, knowledge of occupational health problems of welders, and practice of safety measures. The workshops were also inspected for the presence and provision of up-to-date safety equipment such as fire extinguishers.

### Ethical considerations

Permission was sought from the Ekpoma Technician (Welders) Association (ETA). Informed written consent was obtained from each study subject after a thorough explanation of the objectives and procedures of the study. The benefit of this study was explained to the study population that the concerned body could utilize the results in improving occupational health safety and service. Confidentiality was ensured by making the questionnaire anonymous and avoiding personal identification.

## RESULTS

A total of 58 respondents participated in this study. The age range of respondents was between 19 and 42 years with a

mean age of  $25.78 \pm 5.27$  years, and the highest proportion of respondents, 29 (50.0%) were aged 21-25 years. All the respondents were males 58 (100%). Forty-four (75.9%) of the respondents were Esan, while 14 (24.1%) comprised of Bini, Etsako, and Owan. About three quarters of the respondents were single, and more than half of them

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (n=58)	Percent(%)
<b>Age (years)</b>		
<21	4	6.9
21-25	29	50.0
26-30	18	31.0
31-35	3	5.2
36-40	1	1.7
41-45	3	5.2
Mean age $\pm$ SD = 25.78 $\pm$ 5.27		
<b>Marital Status</b>		
Married	14	24.1
Single	44	75.9
<b>Level of education</b>		
Primary	3	5.2
Junior secondary	36	62.1
Senior secondary	19	32.8
<b>Rank</b>		
Master	5	8.6
Apprentice	48	82.8
"Journeyman"†	5	8.6
<b>Secondary Occupations</b>		
Barbing	3	5.2
Business/Petty trading	1	1.7
Electrician	1	1.7
Mechanic	2	3.4
None	51	87.9

Key: †Journeyman is someone who is skilled in the trade or craft he has learnt and has gone beyond the apprentice phase but still working for someone else in same trade

Table 2: Duration of work

Variable	Frequency (n = 58)	Percent (%)
<b>Duration of work</b>		
< 1 year	9	15.5
1 – 5 years	43	74.1
6 years and above	6	10.3

attempted secondary education [55 (94.9%)], while 3 (5.1%) had only primary education. 51 (87.9%) worked full time, while 7 (12%) worked part-time. Most 48 (82.8%) were in apprenticeship training, 5 (8.6%) were journeymen while the other 5 (8.6%) were Masters.

Majority (74%) of the welders had practiced the trade for between one and five years while only about 10% had practiced for more than six years, while others were less than one year (Table 2.).

**Table 3: Awareness of occupational health problems by respondents**

Variable	Frequency (n = 58)	Percent (%)
<b>Foreign body in the eye</b>		
Not aware	1	1.7
Aware	57	98.3
<b>Arc eye</b>		
Not aware	38	65.5
Aware	20	34.5
<b>Chronic cough</b>		
Not aware	54	93.1
Aware	4	6.9
<b>Breathlessness</b>		
Not aware	55	94.8
Aware	3	5.2
<b>Cuts/injuries from sharp objects</b>		
Not aware	1	1.7
Aware	57	98.3
<b>Burns</b>		
Not aware	0	0.0
Aware	58	100
<b>Electric shock</b>		
Not aware	0	0.0
Aware	58	100
<b>Explosion</b>		
Not aware	2	3.4
Aware	56	96.6
<b>Back pain</b>		
Not aware	3	5.2
Aware	55	94.8
<b>Wrist pain</b>		
Not aware	0	0.0
Aware	58	100
<b>Impaired hearing</b>		
Not aware	13	22.4
Aware	45	77.6
<b>Metal fume fever</b>		
Not aware	58	100
Aware	0	0.0

The study revealed that 58 (100%) respondents were aware of at least one occupational health hazard associated with welding. Occupational hazards (OH) mentioned include electric shock and burns 58 (100%), foreign body in the eye 57 (98.3%), cuts/injuries from sharp objects 57 (98.3%), explosion 56 (96.6%), (Table 3)

**Table 4: Frequency of use of personal protective equipment and reported usage of different personal protective equipment by respondents.**

Variable	Frequency	Percent (%)
<b>Frequency of PPE use</b>		
<b>Eyes (n = 58)</b>		
All the time	56	96.6
Sometimes	1	1.7
Rarely	1	1.7
<b>Ears (n = 20)</b>		
All the time	2	10.0
Sometimes	13	65.0
Rarely	5	25.0
<b>Nose/Mouth (n = 4)</b>		
All the time	0	0.0
Sometimes	4	100
Rarely	0	0.0
<b>Feet (n = 58)</b>		
All the time	36	62.1
Sometimes	22	37.9
Rarely	0	0.0
<b>Hands (n = 34)</b>		
All the time	5	14.7
Sometimes	25	73.5
Rarely	4	11.8
<b>T trunk (n = 53)</b>		
All the time	16	30.2
Sometimes	34	64.2
Rarely	3	5.7
<b>Usage of different PPE</b>		
<b>Eyes (n = 58)</b>		
All the time	56	96.6
Sometimes	1	1.7
Rarely	1	1.7
<b>Ears (n = 20)</b>		
All the time	2	10.0
Sometimes	13	65.0
Rarely	5	25.0
<b>Nose/Mouth (n = 4)</b>		
All the time	0	0.0
Sometimes	4	100
Rarely	0	0.0

Contd.

**Table 4: Contd.**

<b>Feet (n = 58)</b>		
All the time	36	62.1
Sometimes	22	37.9
Rarely	0	0.0
<b>Hands (n = 34)</b>		
All the time	5	14.7
Sometimes	25	73.5
Rarely	4	11.8
<b>Trunk (n = 53)</b>		
All the time	16	30.2
Sometimes	34	64.2
Rarely	3	5.7

All the respondents reported using at least one form of PPE with PPE for the eyes being the most commonly used followed by the feet, trunk, and hand (Table 4).

Association between sociodemographic characteristics and respondents' knowledge of hazards. There was no statistical significance between the level of education and knowledge of hazards (p=0.588). There was no significant relationship between the duration of work and knowledge of hazards (p=0.588).(Table 5)

Association between the type of welding flame used and respondents' knowledge of hazards. There was statistical significance between the type of welding flame used and respondents' knowledge of hazards (p=0.034).(Table 6)

Association between sociodemographic characteristics and respondents' knowledge of PPE. There was no statistical significance between level of education and knowledge of PPE (p=0.269). There was no statistical significance between the duration of work and knowledge of PPE (p=0.648).(Table 7)

**Table 5: Association between sociodemographic characteristics and respondents' knowledge of health hazards of welding profession.**

Variables	Knowledge of hazards			$\chi^2$	p-value
	Poor n=2 (%)	Fair n=7 (%)	Good n=49		
<b>Level of education</b>					
Primary	0(0.0)	0(0.0)	3(100)	3.158†	0.588†
Junior Secondary	2(5.6)	6(16.7)	28(77.8)		
Senior Secondary	0(0.0)	1(5.3)	18(94.7)		
<b>Duration of work (years)</b>					
<1	0(0.0)	1(11.1)	8(88.9)	1.271	1.000 †
1-5	2(4.7)	6(14.0)	35(81.4)		
6+	0(0.0)	0(0.0)	6(100.0)		

**Key:** †Fisher's Exact Test applicable.

**Table 6: Association between welding flame and respondents' knowledge of hazards**

Variables	Knowledge of hazards			$\chi^2$	p-value
	Poor n= 2 (%)	Fair n=7 (%)	Good n= 49 (%)		
<b>Type of welding flame</b>					
Oxyacetylene ('carbade')	1(100)	0(0.0)	0(0.0)	8.744	0.034*†
Electric arc	1(1.8)	7(12.3)	49(86.0)		

**Key:** \*Statistically significant, †Fisher's Exact Test applicable.

**Table 7: Association between sociodemographic characteristics and respondents’ knowledge of PPEs**

Variables	Knowledge of PPE			$\chi^2$	p-value
	Poor n=4 (%)	Fair 27 (%)	Good n= 27 (%)		
<b>Level of education</b>					
Primary	0(0.0)	1(33.3%)	2(66.7)	5.098†	0.269†
Junior Secondary	4(11.1)	19(52.8)	13(36.1)		
Senior Secondary	0(0.0)	7(36.8)	12(63.2)		
<b>Duration of work (years)</b>					
<1	0(0.0)	6(66.7)	3(33.3)	2.365	0.648†
1-5	4(9.3)	19(44.2)	20(46.5)		
6+	0(0.0)	2(33.3)	4(66.7)		

Key:†Fisher's Exact Test applicable.

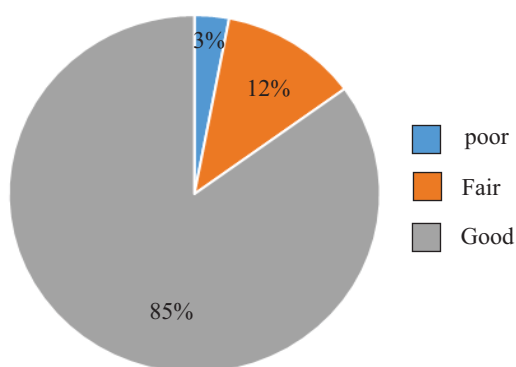


Figure 1: Knowledge of occupational health problems

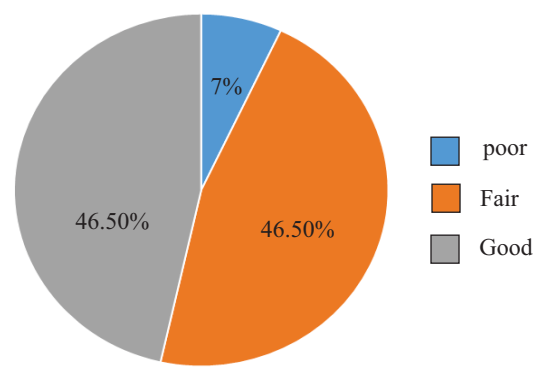


Figure 2: Knowledge on PPE use by welders

The proportion of knowledge of hazards amongst respondents. 49 (85%) of the respondents had good knowledge of occupational hazards experienced by welders, 7 (12%) had fair knowledge, while 2 (3%) had poor knowledge (Fig.1)

The knowledge of use of Personal Protective Equipment (PPE) amongst respondents revealed that 27 (46.6%) of the respondents had a fair knowledge of PPE, 27 (46.6%) had good knowledge of PPE while 4 (6.8%) had poor knowledge of PPE.(Fig.2)



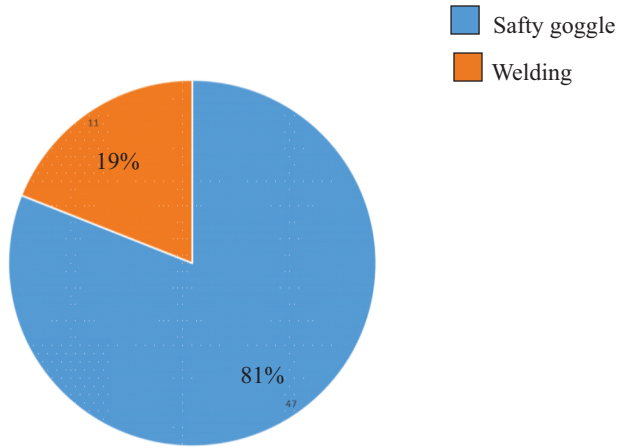


Figure 3: Proportion of protective equipment normally used for the eyes when welding

The commonly used PPEs for the eyes were safety goggles 47 (81%) and welding shield 11 (19%).

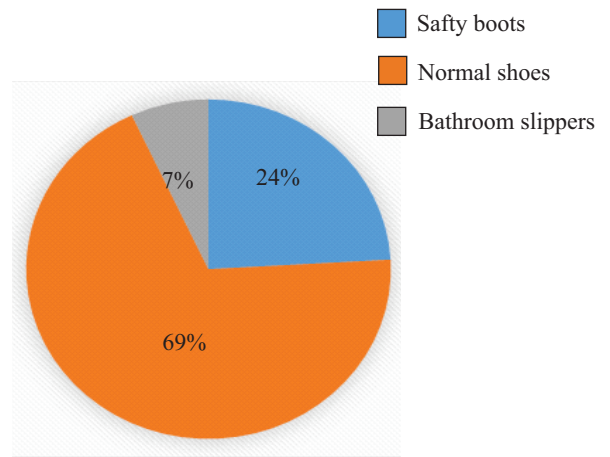


Figure 4: Protective equipment used for the feet while welding

The commonly used PPEs for the feet were regular shoes, 40 (69%), safety boots 14 (24.1%), and bathroom slippers (6.9%). (Fig. 4)

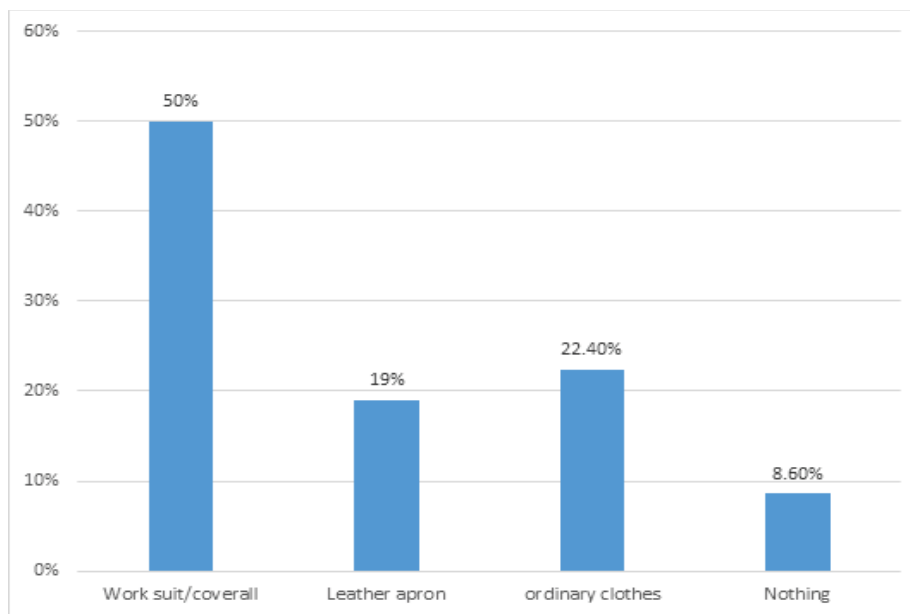
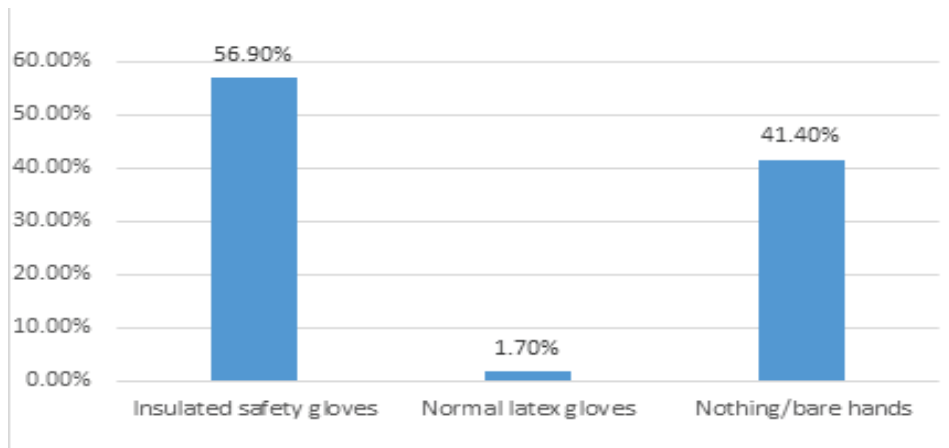


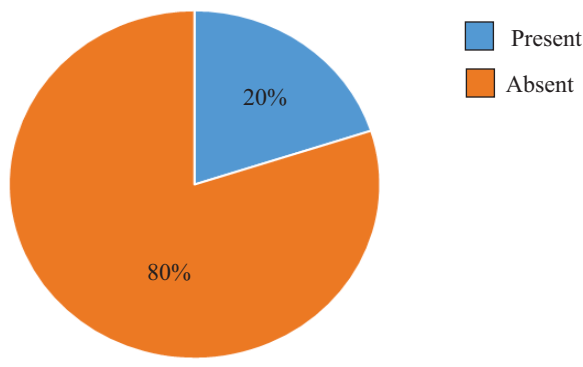
Figure 5: Protective equipment used on the trunk while welding

The commonly used PPEs for the trunk were work suit/coverall 29 (50%), ordinary clothes 13 (22.4%), and leather apron 11 (19%). (Figure. 5)



**Figure 6: Protective equipment used on the hands while welding**

The commonly used PPE for the hands was insulated safety gloves 33 (56.9%). (Figure 6)



**Figure 7: Workers with fire extinguisher in their workshop\***

Key: \*Of the workshops with fire Extinguisher, 12(50%) were valid in terms of having gas and yet to expire. Twenty-four (80%) respondents had a fire extinguisher in their shop. (Figure 7)

**DISCUSSION**

The welding occupation provides a means of livelihood for many Nigerians, but like other occupations, it is not without its own occupational hazards. Awareness of these hazards is the first step in avoiding them. All the respondents in this study were males, indicating a trade dominated by the male

gender and perhaps reflecting differential gender roles in this part of the country. Males tend to select themselves into more physically strenuous occupations while their female counterparts are drifted towards the less physically demanding jobs. This finding may persist for a long time if urgent interventions are not taken because the developing countries like Nigeria, where proper mechanization of the occupation is far from being a reality, the female folks would be kept away as long as the work remains physically extraneous. It is interesting to note that reports from Northern Nigeria showed the same gender bias.<sup>14</sup> The majority of the respondents in this study were less than 50 years of age. Studies conducted in Benin City and Osogbo also have similar findings concerning the age of most of the respondents.<sup>13,15</sup> The majority of the respondents in this study had apprenticeship training. This may be the reason why majority of the respondents in this study were below 50 years. The high number of apprenticeship as seen in this study is similar to findings from another study carried out in Osogbo, Nigeria.<sup>13</sup> This is because apprenticeship is the most common form of training welders receive in Nigeria, and only a small proportion of welders are trained in the formal educational institutions, and it could also be a cost-saving measure since formal welding schools are not readily available for the youths to be engaged with and the few available ones tend to charge higher fees as compared to this informal apprenticeship training that seems cheaper, with occasional provision of some pocket money for the



trainees as well as affording all categories of persons irrespective of their educational background the opportunity to acquire training. Also, it is likely that since a majority of the respondents are young people who are apprentices with little or no formal education, it may influence their knowledge of hazards of the occupation and their perception of risk even when they become independent of their masters or trainers.

All the respondents were aware of at least one hazard related to their work. This compares well with studies on welders in Eastern Nepal and Kaduna, Nigeria, in which the majority of welders were aware of at least one or more workplace hazards related to welding occupation.<sup>10,14</sup> More than half of the respondents had good knowledge of occupational hazards associated with welding. This seems to be revealing of the fact that despite their low level of formal education, there is concern about hazards of the welding occupation probably as a result of the fact that they may have been informed during apprenticeship, purchase of equipment.

In this study, knowledge of hazards had a statistically significant association with the type of welding flame used by the respondents. Those welders who used the oxyacetylene type of flame tend to have poor knowledge of occupational hazards of the welders compared to their counterparts who used electric arc as their source of flame for their welding procedures. This finding could be because the source of flame used by most of this study participants was electric arc compared to the oxyacetylene flame type. A study with a larger sample or a comparative study of the welders using the two types of flames would be more insightful and revealing. Also, in this study, it was found that among many other hazards related to the welding occupation, welders were most aware of electric shock, cuts/injuries from sharp objects, and explosions. This finding is similar to that seen in the study carried out in Ethiopia.<sup>16</sup>

In this study, about one-half of the respondents showed a fair knowledge of PPE used by welders with only a small proportion of these welders demonstrating good knowledge of PPE use. Of the different types of PPEs recommended for welders, they showed low levels of utilization of PPE regarding respiratory system and hearing protection but used more of safety goggles, insulated safety gloves, and work suits/coverall. Similar findings were observed in a study from Eastern Nepal in which welders were least aware of hearing and respiratory PPE and used these PPE less frequently than safety boots, gloves, and welding goggles/eye shields.<sup>10</sup> Also, consistent with the

findings from a study among Northern Nigerian welders worn eye goggles, hand gloves, and safety boots, as the common types of PPE in use.<sup>14</sup> It was, however, in contrast to the report by Kumar et al.<sup>12</sup> where it was found that none of the welders in their study in India were aware of any respiratory and hearing protective equipment, and none of the welders used any respiratory PPE.<sup>12</sup> The poor utilization of hearing and respiratory personal protective equipment could be as a result of these welders' poor knowledge of the resultant health problem. Unfortunately, the hearing impairment that could occur from this occupation is usually progressive and irreversible.

Similarly, according to the findings from a cross-sectional study that examined the use of PPE among small scale welders in Lusaka Zambia, in May 2015, it was found that out of 430 welders, the most commonly used PPE reported were suits/coveralls (n=288, 67.0%) and safety boots (n=247, 57%). This was consistent with finding seen in this study and in likewise manner, ear, and respiratory PPE had the lowest frequencies of use (6% and 16% respectively).<sup>17</sup> A relatively similar finding was the report on the utilization of safety measures among welders in Aksum and Adwa Towns, Tigray region, Ethiopia in 2013, which showed that out of 260 respondents, 225 (86.5%) workers used PPEs. Among respondents who used PPEs, eye goggles accounted for the highest percent (80.8%), followed by an apron (76.9%) and the least (34.2%) wore ear plug.<sup>16</sup> In a similar study carried out on the utilization of PPE amongst welders in Jos metropolis, Plateau State, Nigeria in 2018 revealed that out of 295 welders, almost all the respondents reported using PPE in the workplace with goggles (98.0%) being the most commonly used followed by gloves (65.4%), boots (58.0%) and overalls (36.3%).<sup>18</sup> In a study on the utilization of safety measures among welders in Kaduna metropolis, Northern Nigeria carried out in 2009 carried out among 330 welders, it showed that 60.9% of the welders used eye goggles, 50.3% used hand gloves, 10.0% used ear muffs and 34.5% wore protective boots.<sup>14</sup>

Variations in the type of PPE commonly used among welders could be due to availability and access to the different types of PPE. More importantly, it could be due to the fact that working with flame, the welders would feel they could have their eyes damaged especially with the release of fire particles while the welding process is ongoing. Also, of importance is the fact that the differences in adherence and type of protective equipment use could be due to variations in work cultures and safety practices among welders in these locations. The factor of comfort cannot be ruled out in the selection and use of PPE by the

welders in these studies. For instance, welders in South Western Nigeria attributed their non-use of protective eye devices mostly to discomfort while an ample proportion had no specific reason.<sup>19</sup> Of note from this study is the tendency to use eye goggles by majority of the welders. This readiness can be harnessed for health education toward achieving an ample communication change that would improve the practice of use of PPEs in general.

In this study, 24 (80.0%) of the respondents had fire extinguishers in their shop. Fifty percent of these shops surveyed either had the dates expired, or the content had leaked away. This is similar to the finding from the study carried out in Metal Welders in Jinja Municipality-Jinja District Uganda on the determinants of compliance with occupational Health and Safety Practices carried out among 240 welders in 2018, where it was revealed that only 50% (120) of the welders complied with the welding occupational health and safety practices.<sup>20</sup> The possession of a fire extinguisher in a welding workshop is a welcome development, but it becomes more frustrating with false hope if the owner of such equipment does not occasionally check the status of the equipment. This is particularly important as the occurrence of fire incidents with the presumption that there is a fire extinguisher in the workshop would be disastrous. The high rate of possessing a fire extinguisher may be because there is no fire service station in the local government and the entire senatorial district. Making sure the shop owner checks the status of their equipment may require some training and regular reminders as well as enforcement by regulatory bodies.

## CONCLUSION

In this study, most welders were aware of occupational hazards and related PPE for their work. This awareness and knowledge of PPE and safety practices did not translate into the use of PPE and other practices of safety measures at the workplace. Some of the welders reported having never used the recommended PPE while none of the welders reported using all the required PPE at any given time. The use of individual specific PPE especially those recommended for the respiratory and hearing were abysmally poor.

## Recommendation

We, therefore, recommend a sustained health education information regarding welding hazards and PPE as well as information on safe work practices, the need to put in place some safety adherence measures like carrot and stick

approach to ensure that these welders comply with the use of PPEs and safety measures in their workplaces.

## Limitation

This study was a cross-sectional study and thus may limit the generalization of its findings.

## Definitions of terms as applied in the study

**Journeyman:** Someone who is skilled in the trade or craft he has learnt and has gone beyond the apprentice phase but still working for someone else in same trade.

**Occupational Hazard:** Any activity, process, or materials related to welding with the potential to cause harm or adverse health effects on people performing this task.

**Personal Protective Equipment:** Devices (goggles, respirators/face masks, welding helmets/shield, safety boots, fire-resistant aprons, work suit/coverall, and insulated gloves) used to prevent or reduce exposure of the welders to workplace hazards.

**Risk:** The probability of harm or an adverse health effect occurring to a person exposed to a hazard.

**Small Scale Enterprise:** A business entity whose total number of workers is less than 10. These may or may not be registered with the company registrar.

**Welder:** Any person who performs welding processes, including apprentices.

**Welding:** The process of joining metal pieces using molten metal that is produced at the joint by heat, pressure, or both heat and pressure.

## Consent for publication

Not applicable

## Availability of data and material

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

## Competing interests

The authors declare that they have no competing interests

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The research was self-sponsored.

## Authors' contributions

EFO, SOA, and KOI conceived the study and developed the protocol. All authors were involved in data collection, analysis, and writing the manuscript.

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### REFERENCES

- Park K. Occupational health. In: Park's Textbook of Preventive and Social Medicine. 23<sup>rd</sup>ed. Jabalpur, India: Banarasidas Bhanot Publishers; 2015. Chapter 15, Occupational Health; pp 803–19.
- Bhumika TV, Megha T, Richa J, Prachi P, Eti R. Occupational injuries, and safety measures adopted by welding workers, a cross-sectional study in South India. *Global J Med Pub Heal*. 2014;3(5).
- Ekpo AH. The informal sector. 2012. Available from: <http://www.onlinenigeria.com> Accessed on June 4, 2017.
- The Department of Labour Wellington, New Zealand (2006). Health and safety in welding. Available from: <http://worksafe.govt.nz> Accessed on May 27, 2017.
- Erdal S, Berman L. Occupational exposure environment, risk factors, and hazard awareness of metal sculptors and artist welders in the U.S. 2008. Available from: <http://www.cieh.org> Accessed June 9, 2017.
- Twinn S, Roberts B, Andrew S (eds). Community health care nursing: principles for practice. Buterworth Heineman London 1996;447-457
- Welding hazards AFSCME factsheet 2011. Available from <http://www.afscme.org>. Accessed on 20 May 2017.
- Infrastructure Health & Safety Association. Safe work practices/safe job procedures. Available from [www.ihsa.ca/resources/safe\\_practices\\_procedures.aspx](http://www.ihsa.ca/resources/safe_practices_procedures.aspx) Accessed on 22 May 2017.
- Syed MH, Usama N, Kanwal A, Usama T. An assessment of the level of awareness and reported complaints regarding occupational health hazards and the utilization of personal protective equipment among the welders of Lahore, Pakistan. *Int J Occup Environ Health* 2017; 23(2): 98-109. Budhathoki
- SS, Singh SB, Sagtani RA, Niraula SR, and Pokharel PK. Awareness of occupational hazards and use of safety measures among welders: a cross-sectional study from eastern Nepal *BMJ Open*. 2014; 4(6): e004646. doi: [10.1136/bmjopen-2013-004646](https://doi.org/10.1136/bmjopen-2013-004646) Accessed on 20 May 2019.
- Joseph N, Venkatesh V, Akash Sk, Hegde S, Moras E, Shenoy NP. Occupation Hazards - Pattern, Awareness, and Preventive Measures among Welders from an Unorganized Sector in India. *J Clin Diagn Res* 2017; 11 ( 5 ) : L C 2 3 - L C 2 8 . doi : 10.7860/JCDR/2017/24977.9879. Accessed on 20 December 2019.
- Ganesh Kumar S, Dharanipriya A, Kar SS. Awareness of occupational injuries and utilization of safety measures among welders in coastal South India. *Int J Occup Environ Med* 2013; 4: 172-177.
- Adelani T, Adewale A, Oladeji MO, Bello YA. Assessment of the use of safety devices by welders in Osogbo, Nigeria. *Inter J Sci Res*. 2014;5(2):397-402.
- Sabitu K, Iliyasu Z, Dauda M M. Awareness of occupational hazards and utilization of safety measures among welders in Kaduna metropolis, Northern Nigeria. *Ann Afr Med* 2009; 8:46-51.
- Isah EC, Okojie OH. Occupational health problems of welders in Benin City, Nigeria. *J. Med and Bio Res* 2006; 5(1) 64-9.
- Berhe BG, Desalegn T, Tesfaye Y. Awareness of Occupational Hazards and Utilization of Safety Measures among Welders in Aksum and Adwa Towns, Tigray Region, Ethiopia. *Journal of Environmental and Public Health* 2019(1):1-7.
- Jessy Z. Occupational Hazards and Use of Personal Protective Equipment among Small Scale Welders in Lusaka, Zambia. Thesis for Master of Philosophy in International Health at the University of Bergen 2015; 1-52. Available from : <https://pdfs.semanticscholar.org/2dc7/b222cefadd3688d7cb2727922d0824d837c4.pdf> Accessed on 20 March 2020.
- Tagurum YO, Gwomson MD, Yakubu PM, Igbita JA, Chingle MP, Chirdan OO. Awareness of occupational hazards and utilization of PPE amongst welders in Jos metropolis, Nigeria. *Int J Res Med Sci* 2018; 6:2227-33.
- Ajayi IA, Adeoye AO, Bekibele CO, Onakpoya OH, Omotoye OJ. Awareness and utilization of protective eye device among welders in a southwestern Nigeria community. *Ann Afr Med*. 2011; 10(4):294-9.
- Oluwole I, Kevin N, Kolawole AK, Ademola AS, Babatunde AA, Mujeeb S. Determinants of Compliance with the Occupational Health and Safety Practices among Metal Welders in Jinja Municipality-Jinja District Uganda. *Med Saf Glob Health* 2018; 7: 140. doi: 10.4172/2574 0407/1000140 Available from: [https://www.researchgate.net/publication/326151365\\_Determinants\\_of\\_Compliance\\_with\\_the\\_Occupational\\_Health\\_and\\_Safety\\_Practices\\_among\\_Metal\\_Welders\\_in\\_Jinja\\_Municipality-Jinja\\_District\\_Uganda](https://www.researchgate.net/publication/326151365_Determinants_of_Compliance_with_the_Occupational_Health_and_Safety_Practices_among_Metal_Welders_in_Jinja_Municipality-Jinja_District_Uganda) Accessed April 18, 2020.