



ORIGINAL ARTICLE

Assessment of Workplace Hazard Awareness, Work-related Health Complaints and Safety Measures among Welders in Benin City, Nigeria

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Keywords

Health complaints,

Occupational
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ABSTRACT

Background: Welding processes are known to expose welders to occupational health hazards. Awareness gap regarding these hazards and their control is a major factor contributing to high rate of occupational illnesses and injuries among welders. This research is aimed at assessing awareness of workplace hazards, work-related health complaints and safety measures among welders in Benin City.

Methods: Data was collected using an interviewer-administered questionnaire from 441 welders recruited by a multistage sampling technique in a descriptive cross-sectional study design. IBM SPSS 25 was used for data entry and analysis. Descriptive and inferential statistics were done with p-values of 0.05 considered statistically significant

Results: High proportions 402 (91.2%) and 435 (98.6%) of the welders had good awareness for their workplace hazards and PPEs respectively, while all 441 (100%) of them were exposed to noise levels > 85 decibels. Itchy eyes, 365 (82.8%), was the most prevalent work-related health complaint. Safety goggles 430 (97.5%) and helmet 11 (2.5%) were the most and least utilized PPE respectively. Overall, a high proportion 349 (79.1%) of the welders had poor usage of PPEs. Educational level was statistically associated with awareness of PPEs (p = 0.02).

Conclusions: There was a high degree of awareness of workplace hazards, PPEs and of some work-related health complaints but poor usage of PPEs among the welders. The National Institute of Welding should implement focused educational interventions to increase understanding of occupational health and the proper use of PPE to mitigate the health risks connected with this profession.

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INTRODUCTION

Welding, which is classified as a hazardous profession is characterized by a number of health hazards and diseases.¹ More than two million people die every year from occupational injuries and diseases, with occupational diseases killing more people than industrial accidents.²⁻⁴ According to the International Labor Organization (ILO), 6,400 people die every day as a result of an industrial accident or illness. According to records, over 313 million workers

suffer non-fatal occupational injuries each year, equating to 860,000 people hurt in the workplace every day, including Nigerian workers.^{5,6} Each year, there are an estimated 4,000 non-fatal welding injuries and over 100 fatal welding accidents in the world. The most common welding injuries are burns, eye injuries, and electrical shocks.⁷

Welding and related procedures come in different forms. The most frequent welding

methods used in small scale industries in Nigeria and other developing nations are electric arc welding and oxyfuel gas welding.⁸ Welders are constantly exposed to a number of hazards, which pose health risks and potential job hazards that can be harmful to their health on the short or long-term, or even lead to death, especially when exposure occurs on a regular basis.^{9,10} Ultraviolet (UV) and infrared radiation (IR), fumes and particulate matter, thermal burns, occupational heat stress, electromagnetic field exposure, noise, inert gas, and electrocution are some of the hazards associated with this occupation. Extreme illumination (glare) and UV exposure can cause 'arc eye' or 'flash burn' lesions to the cornea, as well as photo-keratosis, double vision, and retinal damage. Welders are also exposed to hazardous metal vapors including a mixture of metals such as zinc, copper, cobalt, nickel, chromium, platinum, and their oxides, which can cause respiratory problems as well as a flu-like illness known as metal fume fever.¹¹⁻¹³ Welding operations also produce harmful gases such as carbon monoxide, ozone, nitric oxide, nitrogen dioxide, phosphine and phosgene. These toxic gases have been known to cause headache, drowsiness, and pulmonary edema.^{14,15}

Welders continuous risk of occupational accidents and diseases is also due to weak mechanisms to provide health and safety services by the appropriate authorities, lack of access to information and training opportunities, lack of understanding of how to utilize safety and protective equipment appropriately, as well as being unaware of the health impacts of the activities and materials they deal with.^{8,16}

Literature reveals that welders have a high level of awareness of their occupational dangers, but this does not influence their use of protective equipment.¹¹ In small businesses where traditional occupational safety and health control concepts are difficult to implement, the use of personal protective equipment (PPE) is regarded as the most adequate method of protection for welders.¹⁷ Welding seems to be a common informal sector work in Nigeria, and understanding the scope of occupational hazards and safety concerns of welders is a good public health initiative that has the potential for

government and other stakeholders' interventions. This will seek to protect and mitigate potential dangers to their health and persons. In light of the above, this study sought to assess awareness of workplace hazards, health-related complaints and safety measures among welders in Benin City.

METHODOLOGY

The study was conducted in Benin City, the capital of Edo State. The city has a projected population of 1,782,000 based on the 2006 census.¹⁸ The study was carried out from November 2019 to March 2021. The target population were welders and their apprentices who had at least one year of training and operating in markets, mechanic workshops and roadsides from the three local government areas (LGAs) of the city. According to the Edo State Welders Association, there are over 1000 welders in Benin, 770 are registered with their workshops, and are distributed throughout 11 zones (Egor with four zones, Ikpoba okha with three zones, and Oredo with four zones). The Cochran formula for a descriptive cross-sectional study,¹⁹ using prevalence of 77.9%²⁰ from a previous study, a standard error of 0.05, a standard normal deviate of 1.96, a 1.5 design effect and a 10% non-response rate were used to arrive at the sample size. The calculated minimum sample size was 441, however 450 welders were included in the study.

A multistage sampling technique was utilized to select the participants in three stages: In stage 1, two zones each were selected to make six zones from the eleven available zones using simple random sampling by balloting. Stage 2 involved the selection of the welder's workshops by obtaining a list of the workshops from the association's headquarter for use as a sampling frame and the sampling interval calculated by dividing the total number of workshops by the minimum sample size, thus giving a sampling interval of 1.7. The workshops were then selected using the sampling interval of 2. In stage 3, all the welders who were present on the day of data collection were interviewed.

Ethical approval for the study was obtained from the Ethics and Research Committee of the

Ministry of Health (SMOH), Edo State, with reference number HA 737/93. A signed informed consent was obtained from the welders before proceeding with the study, assuring them of confidentiality. Data was collected on social-demographic characteristics of the welders, their work experience, awareness of occupational hazards and of PPEs, use of PPEs and health-related complaints, using a pretested and a structured interviewer-administered questionnaire. Noise measurements were carried out around the filing/cutting machine areas which were observed to be the noisiest area of the work environment using a digital sound level meter model CE.AZ8928 that measured noise levels between 40 - 130 decibels.

To measure the awareness of hazards and of the PPEs, 12 questions were used for the hazards and 13 for the PPEs. These questions were answered by "Yes" and "No" options. "Yes" was assigned 1 point and "No" was assigned 0 points. Total scores were converted to percentages and graded 0-49 as poor, 50-69 as fair, and ≥ 70 as good awareness scores for both hazards and PPEs. For use of PPEs, 13 questions were used. These questions were answered by "Yes" and "No" options. "Yes" was assigned 1 point and "No" was assigned 0 points. Total scores were converted to percentages and graded 0-30 as poor, 31-50 as fair, and ≥ 50 as good usage scores for PPEs.

Data was processed using the IBM SPSS, version 25.0, descriptive statistics used in data analysis and the chi-square test for evaluating associations between dependent and independent variables with statistically significant levels set at $p < 0.05$. Results are presented as tables and figures.

RESULTS

A total of 441 (98%) out of the 450 welders included in the study were successfully interviewed, giving a response rate of 98%. All of them were males with age range of 17 - 59 years and a mean age of 30.8 ± 9.7 years. Two hundred and forty-seven (56%) of them were never married and 188 (44%) were married, 98.6% were literate with a majority 325 (73.7%) having

secondary school education and 429 (97.3%) training as apprentices to become welders. The mean duration of working period per day was 9.2 ± 1.1 hours with 373 (84.6%) working more than 8 hours per day and 416 (94%) working on a full-time basis. A majority 438 (99.3%) used metal arc welding methods, with only 3 welders (0.7%) using gas welding. (Table 1)

Table 2 shows the proportions of welders who were aware of various hazards encountered in their workplaces. All the welders 441 (100.0%) were aware of exposure to bright light, electricity, sharp metal edges, flying sparks/particles, falling objects and uncomfortable work postures as potential sources of injuries in their places of work. Explosion was the least known hazard with 56 (12.7%) among the welders. Overall, 402 (91.2%) of the welders had a good awareness score for their workplace hazards, the awareness score for 8.8% of them was fair and none had poor awareness score.

Figure 1 shows the noise levels recorded around the filing/cutting machine in the welder's work environment. All the welders were exposed to noise levels greater than 85 decibels (dB) with 259 (58.8%) having noise levels of between 96 to 105 decibels

Table 3 shows the awareness and usage of the various personal protective equipment. High proportions 441 (100%), were recorded for awareness of eye and body protection respectively, 440 (99.8%) each for head, foot, and hand protection, 398 (90.2%) for respiratory and 265 (60.1%) for ear protection. The proportions recorded for the corresponding usage of personal protective equipment were all lower than those for their awareness, (430 (97.5%) for eye, 220 (49.9%) for body, 11 (2.5%) for head, 213 (48.3%) for hand, 110 (24.9%) for respiratory and 37 (8.4%) for body). except for foot protection with the same proportion 440 (99.8%) as its awareness. The most used PPE was the safety goggle with 430 (97.5%), followed by coverall/work-suit with 217 (49.2%) and safety boots with 212 (48.1%). Leather aprons and respirators were each used by only 3 (0.7%), while none (0%) of the welder reported the use of welding helmet with or

without visors. Other non-recommended protective equipment used were ordinary shoes and slippers 229 (51.9%) and non-insulated rubber gloves 164 (37.2%). Overall, 435 (98.6%) of the welders had a good awareness score for PPEs, 6 (1.4%) for fair and 0 (0%) for poor awareness. Good usage score for PPEs was 0 (0%), 92 (20.9%) had a fair usage score and 349 (79.1%) had a poor usage score for PPEs.

Figure 2 shows the frequency of use of personal protective equipment. Of the welders who used eye, foot, and body protection, 369 (86%), 293 (66.7%) and 118 (54%) respectively, used them all the time. Of the 37 welders who used ear protection only 3 (8.1%) used them all the time. Respiratory protection was used all the time by 27 (24.5%) of the 110 welders who used them while 92 (43.2%) of 213 welders used hand protection all the time.

The associations between some socio-demographic variables with awareness of and PPEs usage among welders are shown in Table 4. There were a statistically significant relationships between the educational level and awareness of and usage personal protective equipment ($p = 0.020$), with the literate welders having better awareness and those with primary and secondary education having better usage scores. The employment pattern of the welders was also statistically significantly associated with the personal protective equipment usage ($p = 0.02$), with the full-time welders having better usage of the protective equipment.

Table 5 shows the work-related health complaints among welders in the last six months. The proportions of those who reported lower respiratory symptoms, upper respiratory symptoms, eye problems, cuts, burns and symptoms of metal fume fever were 244 (55.3%), 315 (78%), 369 (83.6%), 337 (76.4%), 354 (80.2) % and 293 (66.4) % respectively. Among the respondents who reported these work-related health complaints, 2 (0.8%), 15 (4.8%), 156 (42.3%), 93 (27.6%), 43 (12.1%) and 73 (24.9%) sought medical attention for these related complaints for lower respiratory symptoms, for upper respiratory tract symptoms, for eye symptoms, for cuts, burns and for metal fume fever respectively. (Figure 3)

Table 1: Socio-demographic Characteristics of Welders in Benin City

| Variables | Frequency (n = 441) | Percent |
|---------------------------------------|----------------------------|----------------|
| Age group (years) | | |
| 10 – 19 | 30 | 6.8 |
| 20 – 29 | 209 | 47.4 |
| 30 - 39 | 111 | 25.2 |
| 40 – 49 | 74 | 16.8 |
| 50 – 59 | 17 | 3.9 |
| Mean =30.8 ± 9.7 | | |
| Marital Status | | |
| Never married | 247 | 56.0 |
| Ever married | 194 | 44.0 |
| Level of Education | | |
| None | 6 | 1.4 |
| Primary | 94 | 21.3 |
| Secondary | 325 | 73.7 |
| Tertiary | 16 | 3.6 |
| How respondent became a welder | | |
| Apprenticeship | 429 | 97.3 |
| Technical Training | 12 | 2.7 |
| Employment Pattern | | |
| Full Time | 416 | 94.3 |
| Part Time | 25 | 5.7 |
| Work hours/day | | |
| 3-4 | 3 | 0.7 |
| 5-6 | 7 | 1.6 |
| 7-8 | 58 | 13.2 |
| 9-10 | 351 | 79.6 |
| 11-12 | 22 | 5.0 |
| Mean = 9.2 ± 1.1 | | |
| Welding method | | |
| Manual metal arc | 438 | 99.3 |
| Gas welding | 3 | 0.7 |

Table 2. Awareness of occupational hazards among welders in Benin City

| Variable | Frequency (n=441) | Percent |
|-----------------------------|-------------------|---------|
| Explosion | 56 | 12.7 |
| Welding fumes and gases | 290 | 65.8 |
| Vibrations | 323 | 73.2 |
| Noise | 340 | 77.1 |
| Heat | 414 | 93.9 |
| Fire | 440 | 99.8 |
| Electricity | 441 | 100 |
| Sharp edges/metals | 441 | 100 |
| Flying sparks/particles | 441 | 100 |
| Falling objects | 441 | 100 |
| Uncomfortable work postures | 441 | 100 |
| Bright Light | 441 | 100 |



Figure 1: Noise level measurements for welders in their work environment

Table 3: Awareness and usage of personal protective equipment (PPE) among the welders

| Variable | Awareness of PPE | Use of PPE |
|--------------------------------|--------------------|-------------------|
| | (n=441) | (n=441) |
| | Frequency (%) | Frequency (%) |
| Body protection: | | |
| Coverall/work suit | 441 (100.0) | 217 (49.2) |
| Leather apron | 441 (100.0) | 3 (0.7) |
| Total | 441 (100.0) | 220 (49.9) |
| Eye protection: | | |
| Safety goggles | 441 (100.0) | 430 (97.5) |
| Total | 441 (100.0) | 430 (97.5) |
| Hand protection: | | |
| Insulated safety gloves | 440 (99.8) | 49 (11.1) |
| Non-insulated rubber gloves | 440 (99.8) | 164 (37.2) |
| Total | 440 (99.8) | 213 (48.3) |
| Foot protection: | | |
| Safety boots | 440 (99.8) | 212 (48.1) |
| Ordinary shoes | 440 (99.8) | 156 (35.4) |
| Slippers | 440 (99.8) | 72 (16.3) |
| Total | 440 (99.8) | 440 (99.8) |
| Head protection: | | |
| Welding helmet | 440 (99.8) | 11 (2.5) |
| Total | 440 (99.8) | 11 (2.5) |
| Respiratory protection: | | |
| Face masks | 398 (90.2) | 107 (24.3) |
| Respirators | 398 (90.2) | 3 (0.7) |
| Total | 398 (90.2) | 110 (24.9) |
| Ear protection: | | |
| Earmuffs | 265 (60.1) | 25 (5.7) |
| Ear plugs | 265 (60.1) | 12 (2.7) |
| Total | 265 (60.1) | 37 (8.4) |

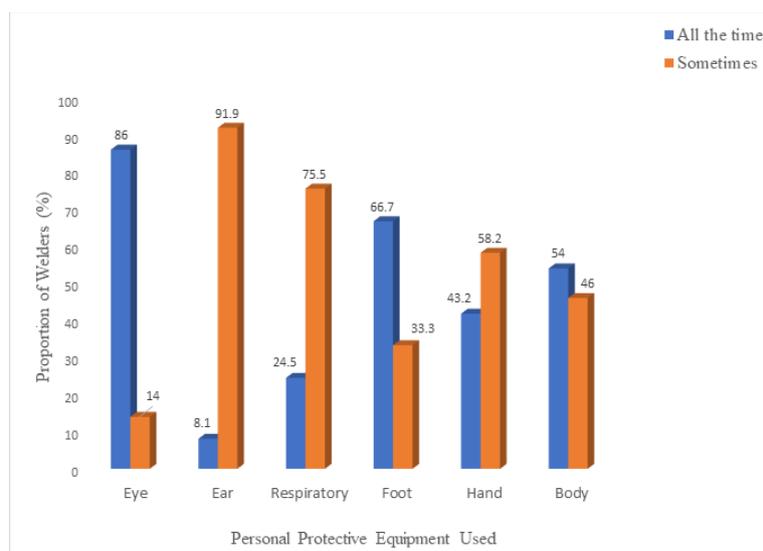


Figure 2: Frequency of PPE usage by welders

Table 4. Association between selected socio-demographic variables with awareness and use of PPE among welders in Benin City

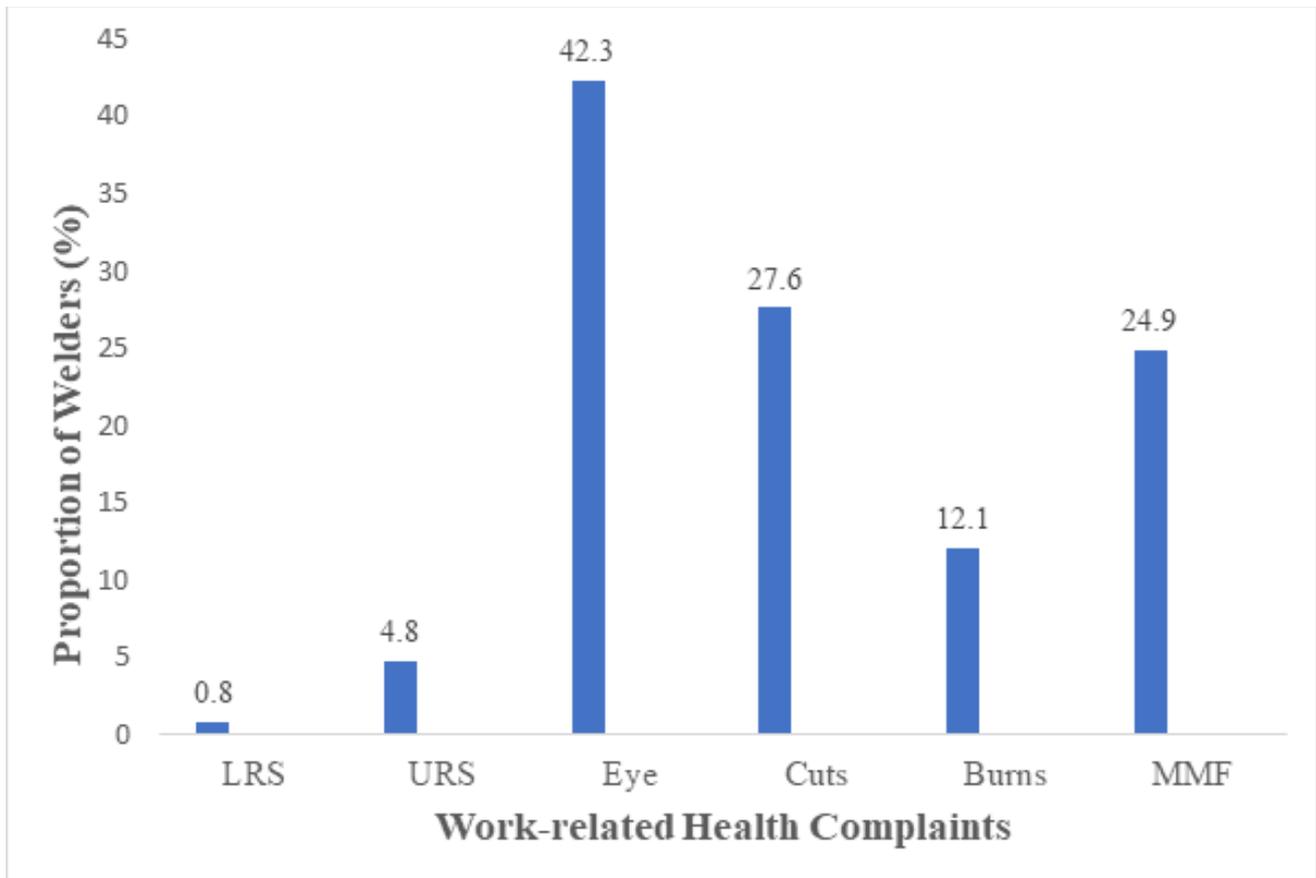
| Variables | AWARENESS OF PPE | |
|---------------------------|---|------------|
| | Good n (%) | Fair n (%) |
| Age group (years) | | |
| 10 - 19. | 29(96.7) | 1 (3.3) |
| 20 – 29 | 206(98.6) | 3(1.4) |
| 30 – 39 | 109 (98.2) | 2 (1.8) |
| 40 – 49 | 73 (98.6) | 1 (1.4) |
| 50 – 59 | 16 (94.1) | 1(5.9) |
| | Fisher’s exact = 2.22; p = 0.69 | |
| Level of education | | |
| None | 5 (83.3) | 1 (16.7) |
| Primary | 93 (98.9) | 1 (1.1) |
| Secondary | 320 (98.5) | 5 (1.5) |
| Tertiary | 15 (93.8) | 1 (6.2) |
| | Fisher’s exact = 9.63; p = 0.02* | |
| Employment pattern | | |
| Full time | 411 (98.8) | 5 1.2) |
| Part time | 24 (96.0) | 1 (4.0) |
| | Fisher’s exact = 0.29; p = 0.24 | |
| | USAGE OF PPE | |
| | Fair n (%) | Poor n (%) |
| Age group (years) | | |
| 10 - 19. | 24 (80.0) | 6 (20.0) |
| 20 – 29 | 171 (81.8) | 38 (18.2) |
| 30 – 39 | 90 (81.1) | 21 (18.9) |
| 40 – 49 | 52 (70.3) | 22 (29.7) |
| 50 – 59 | 12 (70.6) | 5 (29.4) |
| | Fisher’s exact = 5.45; p = 0.24 | |
| Level of education | | |
| None | 4 (66.7) | 2 (33.3) |
| Primary | 79 (84.0) | 15 (16.0) |
| Secondary | 258 (80.1) | 67 (19.9) |
| Tertiary | 8 (50.0) | 8 (50.0) |
| | Fisher’s exact = 10.18; p = 0.02* | |
| Employment pattern | | |
| Full time | 334 (80.3) | 82 (19.7) |
| Part time | 15 (60.0) | 10 (40.0) |
| | Pearson chi-square = 5.88; p = 0.02* | |

**Statistically significant result*

Table 5: Work-related health complaints among respondents in last 6 months

| Variable | Frequency (n=441) | Percent |
|--|--------------------------|----------------|
| Lower Respiratory symptoms | | |
| Yes | 244 | 55.3 |
| Type of lower respiratory symptoms experienced* (n=244) | | |
| Wheezing | 10 | 4.1 |
| Shortness of Breath | 165 | 67.6 |
| Cough | 171 | 70.1 |
| Upper Respiratory Symptoms | | |
| Yes | 315 | 78.0 |
| Type of upper respiratory symptoms experienced* (n=315) | | |
| Runny nose | 197 | 62.5 |
| Stuffy nose | 245 | 77.8 |
| Sneezing after work | 276 | 87.6 |
| Eye symptoms | | |
| Yes | 369 | 83.6 |
| Type of eye symptoms experienced* (n=369) | | |
| Flying particles entering in the eyes | 304 | 82.4 |
| Watery Eyes | 352 | 95.4 |
| Redness and itchy eyes | 365 | 98.9 |
| Cuts | | |
| Yes | 337 | 76.4 |
| Body part involved* (n=337) | | |
| Body trunk | 49 | 14.5 |
| Feet | 237 | 70.3 |
| Hand/Arm | 321 | 95.3 |
| Burns | | |
| Yes | 354 | 80.2 |
| Body part involved* (n=354) | | |
| Body trunk | 46 | 13.0 |
| Feet | 229 | 64.7 |
| Hands/Arms | 354 | 100.0 |
| Metal fume fever | | |
| Yes | 293 | 66.4 |
| Type of symptoms experienced* (n=293) | | |
| Flu like symptoms | 8 | 2.7 |
| Sweet metallic taste | 11 | 3.8 |
| Body chills and fever | 171 | 58.4 |
| General body weakness | 283 | 96.6 |

**Multiple responses*



LRS = Lower Respiratory Symptoms; URS = Upper Respiratory Symptoms; MMF = Metal Fume Fever

Figure 3: Proportion of Welders who seek Medical Attention for Work-Related Health Complaints

DISCUSSION

Welding, like any other occupation is known to be associated with different inherent workplace hazards and risks. In this study, all of the welders were male as reported in other studies in Benin.¹¹ Kaduna¹³ and Lahore.²¹ This indicates different gender roles in this part of the country where males tend to be involved in more physically demanding jobs while females tend to move towards less physical and hazardous jobs. A majority of the welders being within the age bracket of 20 – 29 years is similar to another study in northern Nigeria.²² The high literacy rate is commendable and indicative of a high premium placed on education in the study area and is similar to other studies in Nigeria.^{13,22} A majority of the welders received their training from hands-on apprenticeship as also reported in other studies.^{13,22-24} This is not unexpected as most small scale enterprises in Nigeria operate this form of training where young people learn their trades under the tutelage of a “Master” until they

graduate and are ready to set up their own enterprises

Welders' demographic and exposure characteristics can describe the types of occupational health hazards encountered in their workplaces as they are exposed to different welding hazards in the workplace. Occupational hazards have been well reported among these group of workers in several studies in Tanzania,⁹ Nigeria,^{11,22} Zambia,²³ and Eastern Nepal.²⁵ Welders who worked on full time basis and more so, for longer hours than the recommended 8 hours working period per day by the International Labour Organisation (ILO)²⁶, as seen in this study, were more likely to be exposed to occupational hazards in the work environment, thereby resulting in more devastating health effects

The fact that a majority of the welders had a full grasp of their different occupational hazards is

encouraging. Welding gases and fumes are major sources of several health effects like asthma and cancers, therefore high levels of awareness of these hazards among welders is of public health importance. as it is expected that this will translate to better control measures among them. However, the low awareness rate for explosion is worrying as most of them were not familiar with gas explosions which is a major source of their workplace hazard and injury and can lead to death. The finding of high hazard awareness in this study is similar to the findings in other studies^{11,22,23,25} where levels of awareness of occupational hazards were high but in contrast to other studies carried out in Lahore²¹ and India²⁴ where welders had just fair knowledge about their occupational hazards.

Other activities in this workplace like hammering, grinding, filing and cutting were constant occurrences which generated dangerous noise levels above the 85dB A-weighted average over an 8-hour working period per day, recommended by National Institute for Occupational Safety and Health (NIOSH).²⁷ This noise exposure could either occur as a one-time exposure to extremely loud noise or exposure to constant loud at level for a long period of time.²¹ Disturbingly, all the welders in this study were exposed to noise above 85 decibels and for some, as high as 105dB. Observation during measurement also clearly revealed that welders spent time cutting or filing before moving to other welding activities, and at intervals returned to file/cut for long periods during the day. The implication of this daily exposure to the high noise levels in their workplaces over a long period of time and in the near absence of the use of ear defenders like earmuffs and plugs could on the long run lead to noise-induced hearing loss (NIHL), sensorineural deafness and other non-auditory and psycho-somatic health effects of noise exposure.

The positive and encouraging finding of a high proportion of the welders in this study having awareness of the PPEs, with all of them being aware of goggles and work-suit/coverall is in line with finding from other studies.^{22,23,25,28} A similar study in Jos²² revealed that ear plugs were the least PPEs the welders were aware of as was

obtained in this study. The high level of awareness regarding goggles is probably a result of the constant sparks and heat emitted while welding and whose effects are immediate and dangerous to their eyes, thus the welders were very much aware about of goggles to protect their eyes. The lower levels of awareness regarding ear protection compared to eye protection could be a result of apparent more-delayed health consequences associated with noise hazard. High awareness levels imply that majority of welders in this study were familiar with the appropriate PPEs needed to shield them from their workplace hazards. It is therefore disappointing to note that this high level of awareness of PPEs did not translate to their usage, as statistically significant low usage scores were recorded for all except for eye and foot protections. The most common PPEs used as claimed by the welders were safety goggles and safety boots, though most of the welders were observed not to use them at the time of data collection. Similar findings were documented in other surveys.^{11,22,23} where safety goggles represented the most used PPE. The low scores for PPE usage may also be due to the inability of some welders to purchase these PPEs, a lack of proper training on their use or due to lack of enforcement of the extant laws concerning the non-usage of these PPEs by the responsible authorities.

As expected, the educational attainment of the welders significantly impacted on the level of awareness of personal protective equipment. The ability to read useful literature and news items enhance the knowledge about safety measures and in making informed decisions on how to protect one's health. Surprisingly, the high awareness level recorded in this study did not translate to the usage of the PPEs This result is similar to that obtained from Eastern Nepal which found that educational attainment increased with awareness of PPEs.²⁵ Notably the welders who worked on full time basis had better indices of PPE usage. This may be partly due to the fact that with longer exposure to workplace hazards, these full-time welders realize the importance of personal protective equipment usage on their health compared to their part time colleagues

Due to the nature of hazards associated with the welding profession, all the welders had experienced at least one of the health effects common to their work. Welders reported being affected more by injuries and conditions related to the eyes like arc eye injuries and foreign bodies in the eyes, with cuts, burns and metal fume fever also being frequently reported among them. It is not surprising that there was a high prevalence (82.8%) of eye complaints among the welders as welding activity produces bright light, metal fumes, hot sparks and particles emitted from filing activities. These could have immediate health effects when some of these particles fly into the eyes or when exposed to welding fumes while not using adequate protective equipment. These effects could also be delayed due to gradual and constant exposure to fumes and other chemicals. Despite the high rate of use of safety goggles in this study, welders still reported high prevalence of eye-related complaints. This may probably be due to the fact that some of the welders were observed to be using substandard goggles. Other studies also identified eye related complaints as the most prevalent health complaints among welders.^{11,23,28}

The prevalence of burns and cuts on hands/arm was also very high among welders similar to the study results from Jos.²² Welders' hands/arms are always in close proximity to their instruments of work when grinding, filing, hammering and welding, and this predisposes them to both minor and major injuries from burns and cuts. The use of hand gloves by welders was relatively low which may explain part of the reason for the high prevalence of hand/arm injuries reported. The low scores for PPE usage, especially with low frequencies of usage may also have contributed to the distribution of self-reported health complaints by the welders.

The lack of visits to health facilities to seek medical attention by the majority of welders after sustaining injuries or symptoms relating to the hazards encountered in their workplace is of public health concern and points to poor health-seeking behavior among this group of workers, as they failed to pay much attention to injuries and health complaints they have in their

profession.

Findings from this study points to the urgent need for key intervention measures like educational trainings and workshops to improve the knowledge base of these welders and their better usage of PPEs. This will help to mitigate the dangers associated with occupational hazards in their workplaces. All welders, through their organized associations, should seek proper training to ensure that they are well informed on their occupational hazards, the health consequences, as well as how to utilize standard personal protective equipment correctly in order to reduce the incidence and prevalence of workplace injuries and illnesses. The three tiers of government should partner with the International Labor Organization (ILO) to create, implement and enforce existing policies that will regulate the activities of welders, in order to reduce the prevalence of their work-related health conditions. Furthermore, there is a need for government-backed health campaigns to help treat serious acute and chronic occupational health conditions that may be found among welders, thus improving productivity among them.

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involved in questionnaire design, literature review, the write up and critical review of the manuscript and the supervision of the work from conception to publication. Both authors read and approved the final draft of the manuscript

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