



## Burns Injury among Roadside Welders in Port Harcourt Metropolis, Nigeria

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### ABSTRACT

**Background:** Occupational hazards and safety precautions among welders is an important health topic, especially in developing countries. This study assessed the occurrence of burns injuries among roadside welders in Port Harcourt Metropolis.

**Materials and Methods:** This was a descriptive cross-sectional study design with a study population among roadside welders in Port Harcourt metropolis. Registered roadside welders were included in the study. A two stage sampling method was used to recruit 395 welders into this study. Data were collected from welders in their work places using a close ended structured interviewer-administered questionnaire and was entered into the Statistical Package for Social Science (SPSS) version 25 software for analysis. Ethical clearance for this study was gotten from the Ethics Committee of University of Port Harcourt while signed consent was obtained from each participant. Data were analysed using frequencies, percentages, chi-square and binary logistic regression.

**Results:** Total of 395 questionnaires was filled properly. The outcome of the study showed that most of the participants are electric welders, 81.8% (323), and reported a high prevalence of burns injuries (88.9%), with the face (31.34%) and eye (26.21%) being the part of body burns injury was most experienced, with the number of burns above 10 observed in 42.17% of the welders. There was good knowledge (63.80%) and also the attitude towards the use of personal protective equipment (PPE) (83.80%), although unfortunately did not translate to practice, as PPE possession and utilization rates were poor (Have complete PPE: 36.95%; use gloves always: 5.57%; use coverall always: 7.09%), although most agreed that they use Eye Goggles (79.49%).

**Conclusion:** Based on the findings of the study, it was concluded that welders had good knowledge of burns injuries. However, a little proportion practiced standard safety precautions. Hence, there is need to provide adequate strategies and policies for compliance with safety practices among welders and recommended amongst others that labour ministries should work closely with welders association to ensure that appropriate safety measures are implemented across boards.

**Keywords:** Burns Injury, Welders, Safety precaution, knowledge, awareness

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### I. INTRODUCTION

Occupational hazards and safety precautions among welders is an important health topic, especially in developing countries. Welding has been defined as a type of occupation involving metal cuts using hot flame or electric arc by the International Standard Classification of Occupations (ISCO) (Uter, 2020). While welders could differ by region, the most common in our setting are those utilizing oxyacetylene flame and/or the electric arc where electricity is involved. Due to the nature of their work, most of them are occasionally exposed to hazards from either high temperature or flames generated by the tools they work with or electric shock (Pega, et al., 2020). Injuries ranging from cuts and deep burns have been recorded.

Burns are physical hazards to the skin, or tissues, brought about by heat, cold, power, synthetic substances, grating, or radiation. Most of the burns are from hot fluids, solids, or fire (Herndon, 2012). There

are three kinds of burns: first-degree, second-degree, and third-degree. First-degree burns affect the topmost layer of the skin and could be painful but no deep damage or hurt to the skin, while the second-degree could reach the dermis (lower part layer of the skin), with redness occasionally, and often times swelling, and the last one, third-degree burns affect all layers: epidermis, dermis and the fatty tissues. Nerve damage and blood vessels damage has been observed (Tintinalli, 2010). Deep lacerations or cuts can also occur from flying metals with high velocity during metal beating (Hassan et al., 2017). Also, excessive staring into the bright radiation of the welding rays may cause 'arc eye', injury to the cornea with possible retina impairment (Begaj&Schaal, 2018).

On a global scale, over 350,000 employees die each year as a result of accidental workplace injuries (Hämäläinen et al 2009). Accidents at work cause occupational injury and men employed in the World Health Organization's (WHO) South-East Asia and Africa regions account for more than half of the injury burden (Kumar &Dharanipriya, 2014). Burn injuries are among the most serious of all injuries, having a significant physical, neurological, and psychological effect on the victims. Burns remain one of the leading causes of death and injury worldwide (Lee et al., 2014).

In privately-owned small-scale factories, welders are working in groups of three to five. Since they are part of the unorganized market, safety measures are not strictly enforced. Eye injuries such as arc eye or flash burns to the cornea, photo keratosis, astigmatism, pingecula, cataract and retinal damage caused by excessive light and ultra violet radiation, and foreign body injuries to the cornea are all normal. Metal fume fever and pneumonia are caused by inhaling noxious gases such as zinc, copper, cobalt, nickel, chromium, platinum, and their oxides. Other injuries common among welders in Nigeria include accidental cut injuries, amputations, occupational heat stress, thermal burns, and electrocution. Despite the fact that welding is a major public health problem, few studies have been performed at a global level to determine the pattern of all forms of injuries and their related risk factors (Azuike et al., 2016). Occupational hazards account for 5-7 percent of disability-adjusted life years (DALYs) lost globally, with about 4% in Africa and 2.3 percent in middle-income countries (Hay et al., 2017). In Nigeria, the actual rate of workplace deaths, casualties, and confirmed cases of industrial injury among Nigerian factory workers is 402 incidents per year on average (Awosan et al., 2017).

Despite technical advancements in welder PPEs, machine-incorporated eye-protective devices, and proven preventive effectiveness of PPEs, obstacles to their optimum use remain largely unaddressed worldwide (Tagurum et al. 2018). This lack of PPE use has resulted in a high rate of otherwise preventable welder occupational eye injury and morbidity. According to similar studies, between 50% and 100% of welders are mindful of welding-related ocular risks (Sabitu, et al., 2009).

Despite the serious public health issues that occur among welders, few studies have been undertaken in Nigeria to ascertain the level of sensitivity and experience about all forms of accidents and safety measures. As a result, despite the fact that industrial and freelance welders make up a large portion of the welder population in Southeastern Nigeria, no baseline comparative data on these welders could be identified. Furthermore, unlike industrial welders, private and freelance welders are not protected by the government's regulatory implementation of safety measures of welding activity, making them vulnerable to welding-related eye injury. Therefore, this study intends to assess of burns injuries among roadside welders

### **Objectives of the Study**

These include to:

1. determine the prevalence of workplace burns injury among roadside welders in Port Harcourt Metropolis
2. assess the knowledge of burns injury among roadside welders in Port Harcourt Metropolis
3. assess the safety practices towards burns injury among roadside welders in Port Harcourt Metropolis

## **II. RESEARCH MATERIALS AND METHODS**

### **Research Design**

This was a descriptive cross-sectional study.

### **Study Area**

The study was done in Port Harcourt metropolis.

### **Population for the study**

The study population consist of roadside welders that are located within Port Harcourt metropolis.

### **Inclusion criteria**

1. Registered roadside welders that are 18 years old and above.
2. Welders that have been working for at least one year.

### **Exclusion criteria**

1. Apprentices
2. Interns

**Sample and sampling techniques**

**Sample Size Determination**

The sample size (n) is determined using the sample size for proportions formula (Araoye et al., 2008).

**Sampling Method**

A Two-Stage sampling technique was used to select the welders for the study.

**Method of Data Collection**

The questionnaire was interviewer-administered to the welders at their place of work. Data collection was mainly done in the afternoon as it is the best time to meet with them.

**Methods of Data Analysis**

The data collected were analyzed with the Statistical Package for Social Sciences (SPSS v. 25) software. The data analyzed were presented in tables and charts, mean, standard deviation and logistic regression statistics at a 95% confidence interval and a p-value less than 0.05 was considered significant.

**Ethical considerations**

Ethical approval to carry out this study was obtained from the Ethics committee of the University of Port Harcourt and permission was obtained from the Welders Association in Port Harcourt before the commencement of the study. Informed consent was obtained from each welder before they were included in the study.

**III. RESULTS**

**Research and Analysis**

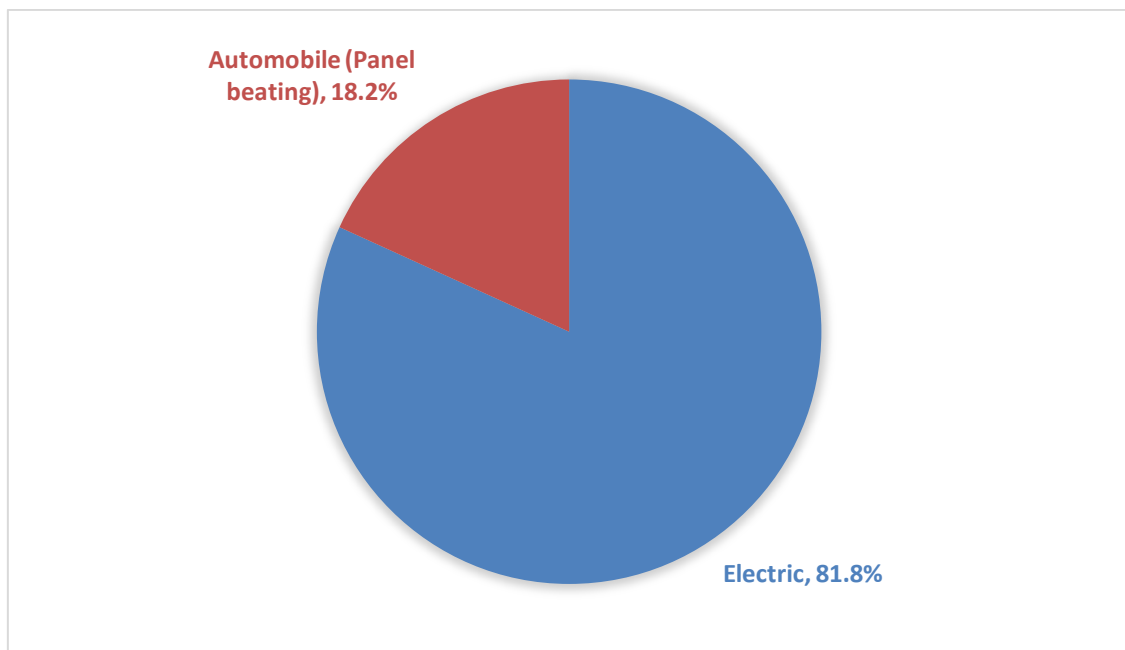
A total of 395 questionnaires were administered and retrieved with a 100% response rate. The 100% response rates were adjudged to be filled with completeness.

**Table 1: Socio-demographic of respondents**

Variables	Frequency (n=395)	Percentage (100%)
<b>Age (years)</b>		
18-28	79	20.00
29-39	240	60.76
40-50	60	15.19
>50	16	4.05
<b>Gender</b>		
Male	395	100.0
Female	0	0.0
<b>Marital Status</b>		
Married	251	63.54
Single	122	30.89
Divorced	16	4.05
Widower	6	1.52
<b>Educational Level</b>		
Primary	34	8.61
Secondary	252	63.80
Tertiary	109	27.59
<b>Religion</b>		
Christianity	385	97.47
Islam	7	1.77
Traditionalist	3	0.76

Respondents within the age range 29-39 years had the highest proportion of, 60.76% (240), followed by those within the age range 18-28 years, 20.00% (79), and 40-50 years, 15.19% (46). The least were those within the age range >50 years, 4.05% (16) (**Table 1**). The study respondents were all males, with most married, 63.54% (251) and single, 30.89% (122) and the rest, divorced, 4.05% (16) or widower, 1.52% (6).

In the present study, respondents with a secondary level of education were highest with a proportion of 63.80% (252), followed by those with a tertiary level of education, 27.59% (109) and primary level of education, 8.61% (34) as shown in Table 4.1. There were no participants with no-formal education educational status.



**Figure 1: Type of Welding**

Most of the respondents indicated that they are electric welders, 81.8% (323), and the others automobile (panel beating), 18.2% (72) as shown in Fig.1.

**Table 2: Prevalence of Burns Injury among respondents**

Variables	Frequency (n=395)	Percentage (100%)
<b>Number of burns (n=351)</b>		
Less than 5	61	17.38
5-10	142	40.46
Above 10	148	42.17
<b>Part of body burns injury was experienced (n=351)</b>		
Face	110	31.34
Eyes	92	26.21
Upper limb	31	8.83
Lower limb	9	2.56
Others	109	31.05
<b>Description of burns (n=351)</b>		
Mild	85	24.22
Moderate	130	37.04
Severe	136	38.75

Most of the respondents indicated that they have had burns injury associated with welding work, 88.86% (351), with the number more among those that have had more than 10 burns, 42.17% (148). Body parts with the most burns experienced were the face, 31.34% (110), and were described as severe for most of the respondents, 38.75% (136) as shown in Table 2.

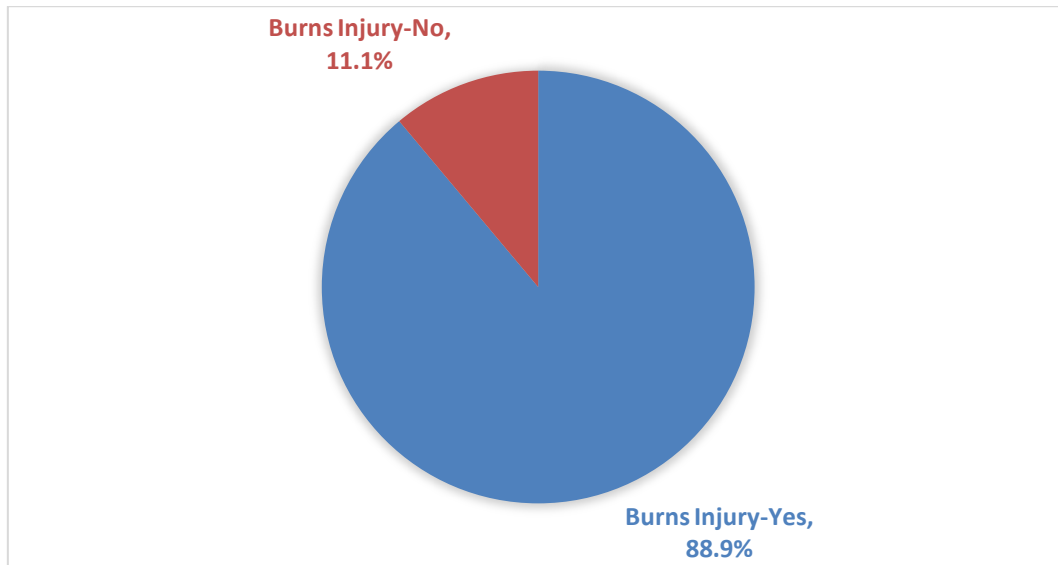


Figure 2: Prevalence of Burns Injury among respondents  
Prevalence of burns injury among respondents was 88.9% as shown in Fig 2.

**Table 3: Knowledge of Burns Injury among respondents**

Variables	Frequency (n=395)	Percentage (100%)
<b>Ever heard of burns injury in welding before</b>		
Yes	373	94.43
No	22	5.57
<b>Where heard about burns injury in welding (n=373)</b>		
A colleague at work	171	45.84
In a workshop	114	30.56
A friend	46	12.33
Social Media	27	7.24
TV/Radio	15	4.02
<b>Health hazard that can occur with welding</b>		
All of the above	249	63.04
Arc eye	47	11.90
Back pain	28	7.09
Electric shock	28	7.09
Burns	22	5.57
Cuts from sharp metals	21	5.32
<b>Think use of PPE helps to prevent burns injury</b>		
Yes	288	72.91
No	18	4.56
I don't know	89	22.53
<b>Consequences of Burns Injury known (n=616)</b>		
<i>(Multiple responses)</i>		
Loss of eyesight	253	41.07
Loss of limb	192	31.17
Wound Infection	171	27.76

Most of the respondents, 94.43% (373), have heard of burns injury in welding before the survey, and mainly from colleagues, 45.84% (171), and in a workshop, 30.56% (114). Other sources were from a friend, 12.33% (46), the social media, 7.24% (27) and TV/Radio, 4.02% (15). Most of the respondents agree that Arc eye, back pain, electric shock, burns and cuts from sharp objects are some of the health hazard associated with the nature of their Job, 63.04% (249). Most also think that using a Personal Protective Equipment (PPE) can help prevent burns injury, 72.91% (288) and other consequences of burns injury like loss of eye sight, 41.07% (253), loss of limb, 31.17% (192) and wound infection, 27.76% (171) as shown in **Table 3**.

**Table 4: Overall Level of Knowledge of Burns Injury among respondents**

Variables	Frequency (n=395)	Percentage (100%)
Poor (≤4)	143	36.20
Good (5-9)	252	63.80

Table 4 presents the level of knowledge of burns injury. In measuring the level of knowledge, Nine (9) knowledge responses were requested from the respondents and scored, based on a correct and wrong answer methodology (as shown in **Table 4**). Those with a correct answer were scored 1 and wrong answer 0. The scores were summed for all participants. Participants with overall good knowledge were scored 5-9, and poor knowledge  $\leq 4$  as shown in **Table 4**. Those with good knowledge were found to be proportionally more compared to those with poor knowledge (63.80% vs. 36.20%).

**Table 5: Safety Practices towards prevention of Burns Injury among respondents**

Variables	Frequency (n=395)	Percentage (100%)
<b>Have complete personal protective equipment (PPE)</b>		
Yes	146	36.96
No	249	63.04
<b>Share PPE with other welders</b>		
Yes	72	18.23
No	323	81.77
<b>Use of gloves during welding</b>		
Always	22	5.57
Sometimes	287	72.66
Never	86	21.77
<b>Use of coveralls during welding</b>		
Always	28	7.09
Sometimes	250	63.29
Never	117	29.62
<b>Use of Eye Goggles during welding</b>		
Always	314	79.49
Sometimes	70	17.72
Never	11	2.78
<b>Have a first aid kit in welding place</b>		
Yes	43	10.89
No	352	89.11

Only a little below half of the respondents, 36.96% (146), have complete personal protective equipment (PPE), although most do not share their PPE with others, 81.77% (323), and use their gloves during welding mostly sometimes, 72.66% (287). Only a small proportion of the respondents use their coverall during welding always, 7.09% (28) or have a first aid kit in welding place, 10.89% (43); but the majority use eye goggles during welding, 79.49% (314) as shown in **Table 5**.

#### IV. DISCUSSION OF FINDINGS

Burn injuries are preventable and yet are still common among welders, with Nigeria being no exception. And despite the provision of occupational safety standards to help curb its incidence, burns have become a major aspect of disability and morbidity among welders and can become serious and unpleasant for welders. Welding as an occupation exposes workers to burns due to exposure to the intense heat generated from arc welding and explosions from gas welding.

In the present study, 351 welders (88.9%) have had a burn injury due to their occupation, which is much higher than the prevalence of (31.0%) observed in another Nigerian study conducted in Kaduna (Sabitu et al., 2009), 33.3% observed in a South Africa study (Raphela, 2015), 47.0% in the United States (Shaikh&Bhojani, 1991) and 53.1% in India (Kumar &Dharanipriya, 2014). The fact that majority of them had more than 5 injuries and more (82.63%) is a concern and similar to previous findings (Ganesh, 2011; Kumar &Dharanipriya, 2014)which could point to the importance in adopting health promotional measures in this group of people to prevent or minimize injuries.

The difference in burns from various countries may be due to the varying safety regulatory procedures adopted by each state. The most common part of the body burns injuries sustained was the face (31.34%) and the eyes (26.21%) which are comparable to other studies. A similar study conducted in Nigeria showed the

prevalence of ocular injuries to be (28.5%), (Okoye&Umeh,2002) which is similar to our study. This was much lower than another study done in Port Harcourt, Nigeria (31.85%) (Fiebai&Awoyesuku, 2011) and in Kampala, Uganda (59.9%) (Atukunda et al., 2019) as welders are at higher risk of experiencing corneal scars due to the nature of their jobs (Fiebai&Awoyesuku, 2011).

Welding is commonly used in small-scale and large-scale industries in Nigeria. Whilst advanced processes and safety measures prevail in larger industries, small-scale welders are mostly self-employed. Eye morbidity has been reported to be related to the lack of use of eye protection among welders. Only 15.3% of the welders who reported or had physical evidence of injury in this study were using protective eyewear at the time of injury.

Welders in the present study had proportionally higher-good knowledge about burns injury (63.8%), collaborating with a study by Awosan et al., (2017), although slightly higher (70.4%). Of serious concern are the very low consistent use of some of the personal protective equipment which ranges from 5.6% for gloves to 7.1% for coveralls, with a high prevalence of injuries (88.8%) recorded despite high levels of awareness (94.4%), good knowledge (63.8%), and also positive attitudes towards the use of PPE (83.8%) among the respondents in the present study.

This proves to the saying that awareness and knowledge may not necessarily lead to practice as an individual may simply refuse to see that they have a problem, as they are in denial even when the evidence available to them shows otherwise. They simply avoid putting to thought anything that concerns the unhealthy behaviour. In a study among welders in Ile-Ife, while the level of awareness is high, less than half of them (45.9%) possessed protective eye devices and only 9.6% made use of the devices (Ajayi et al., 2011), similar to findings in Kaduna (Sabitu et al., 2009). Although the higher proportion of welders in the present study use eye goggles (79.49%), which is similar to (60.9%) in a study by Sabitu et al., (2009), but in contrast to a Nigerian study where only 15.3% of the welders use eye goggles (Fiebai&Awoyesuku, 2011).

Only a little below half of the respondents have complete personal protective equipment (PPE), although most do not share their PPE with others, and use their gloves during welding mostly sometimes. Also, only a small proportion of the respondents use their coverall during welding always or have a first aid kit in the welding place, but the majority use eye goggles during welding. Since manual metal arc welding is the most common method of welding, Ajayi et al (2011) in Nigeria observed its high risks towards exposure to hazards coming from gasses, Ultraviolet radiations and fumes.

It is also not surprising that most welders will utilize eye goggle in the present study. The present study findings are also comparable to other studies among welders in Nepal, Nigeria and India (Ajayiet al., 2011; Budhathokiet al., 2014; Sabitu et al, 2009). It has also been shown that welders lift heavy metals and tools which sort of strain on their muscles and bones. And their lack of safe locations in working environments exposes them to stay on roadsides with more risk for exposures. Several studies confirm that small scale enterprises are characterised by poor working environments.

Compared to larger industries, workers in SMEs tend to work long hours in poor conditions thus exposing themselves to more risks (Molla et al. 2015). Ajayi et al. (2011) their research observed that the exposure to several health hazards is due to very limited exposures and use of PPEs, which could be comparable to other workers including carpenters, painters, and metalworkers. Study finding indicate that physical hazards in welding workshops are not only risky to welders but also present a significant public health hazard.

## V. CONCLUSIONS

Based on the findings of the study, it was concluded that welders had good knowledge of burns injuries. However, a little proportion practiced standard safety precautions. Hence, there is need to provide adequate strategies and policies for compliance with safety practices among welders.

## VI. RECOMMENDATIONS

Based on the findings of this study the following recommendations are hereby made:

1. Labour ministries should work closely with welders association to ensure that appropriate safety measures are implemented across boards and to also support in ensuring PPEs are subsidized/affordable.
2. Regular inspection of the roadside welders workshop to ascertain PPE availability will increase utilization in practice
3. Through the mass media, welders can be encouraged to go for fresher training to update their knowledge on current safety practices in their chosen field
4. Welders should be encouraged to attend seminars and workshop on the use of tools and equipment in order to prevent accident, injury and even death.
5. The roadside welders should be encouraged to use the appropriate PPE at all times to perform their jobs.

**Conflict of interest:** None to declare

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