Hazard Evaluation of Welding and Fabrication Workshops in Minna Metropolis, Nigeria

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Abstract- ***Risk is the probability that a person will be injured or experience harmful health effects from exposure to a danger, and welders' workplaces are full of hazards. This study aims to evaluate welding workshop risks and welders' use of safety procedures in the Minna metropolis. There were 66 workshops included in this descriptive, cross-sectional study in the Minna metropolis. Data were gathered using a questionnaire and processed and analyzed using SPSS version 16 software. Manual handling, noise/vibration, and smells had the highest frequencies among the dangers found in the workshops. Each workshop had good lighting and ventilation. None of the stores had first aid kits, fire extinguishers, or labels for hazardous materials. The majority of the workshops offered workers eyewear, but none of the ones evaluated offered a helmet, apron, or hearing protection. According to this study, manual metal arc welding (electric) was done in almost all of the workshops, and the major dangers found in the welding workshops were manual handling of welding equipment, noise, vibration, and pollutants. Even though there was good environmental control, including adequate lighting and ventilation, the PPE was not provided in a sufficient manner. It is advised that the welders' association, local and state governments maintain an ongoing education campaign for welders on occupational risks, suitable environmental control measures, and the provision and proper use of various PPE on a regular basis.***

Indexed Terms- ***Hazard, Welding and Fabrication, Workshop, Minna***

I. INTRODUCTION

The method of welding is highly engineered and has advanced along with technology. Due to increased urbanization and industrialisation, welding has become one of the most prominent occupational groupings in many emerging nations (Aliyu and Amadu, 2017). Everyday life would not be conceivable without welding; everything from vehicles to sky-high office buildings, rockets to airplanes, pipelines to motorways, would not be possible. This indicates that a big number of people work in the welding industry. Welders are classified by the International Standard Classification of Occupations (ISCO) as people who connect and cut metal using flame, electric arc, and other heat sources (Ikechukwu, Ibukun and Zubair, 2014).

According to the World Health Organization (WHO), there are over 250 million incidents of work-related injuries every year, and non-industrial welding in developing nations is one of the activities that contribute to these injuries (Aliyu and Amadu, 2017).The risk of fatal injuries as a result of welding alone is estimated to be more than four deaths per thousand workers over the course of a working lifetime, according to studies from the Occupational Safety and Health Administration (OSHA) (Riccelli, Goldoni, Poli, Mozzoni, Cavallo and Corradi, 2020). Young individuals from lower socioeconomic classes make up a big portion of the welding workforce in Nigeria as well, which puts them at a disadvantage in terms of occupational health and safety. This is due to the fact that majority of the country learns to weld on the job informally. The country's economic progress is largely aided by the informal sector. These businesses are run by artisans who typically have only completed their primary school, if any (Yetunde, Chundung, Martin, Pankyes, James and Moses, 2018). As a result, they are exposed to a variety of welding-related risks. Although there are many different welding techniques, the two most used in Nigeria are electric arc welding and gas welding using an oxyacetylene flame (Okechukwu, Nkiruka, Theophilus, Anulika, Chidera and Peter, 2018).

Risk is the possibility that someone will experience harm or have negative health impacts as a result of being exposed to a hazard. The job environment for welders contains a number of risks. To identify the risks connected with welding, a lot of investigation has been done (Chauhan, Anand, Kishore, Danielsen and Ingle, 2014). A thorough industrial risk assessment of the welding workplace is currently the norm for health surveillance for welding operations. For the purpose of evaluating health surveillance, each welding workplace needs to undergo a repetitive industrial risk assessment. The biggest problem has been creating occupational health programs that are practical in developing countries like Nigeria and in small and medium-sized businesses (which make up the majority of industries in Nigeria).

According to a number of variables, including the type of welding being done, the material the electrode is made of, the type of material being welded, the presence of coatings on the metal, the voltage and current being used, and the type of ventilation, inadequate ventilation poses a risk to welders (Christopher, 2017). To prevent overexposure to the gases and fumes produced during welding and cutting, enough ventilation is used. The fumes and gases will be kept out of the welder's breathing area with adequate ventilation.

Overexposure to hazardous material vapors can have immediate (short-term) or long-term (chronic) health impacts. Toxic levels of fumes and gases may be created, and they can replace oxygen in the air, causing asphyxiation, sickness, unconsciousness, and even death. The amount and type of operations taking place, the size and form of the workspace, the fume plume's composition, the worker's and welder's head position, and the type and efficiency of the ventilation all affect how well it is ventilated (Kandyala, Raghavendra and Rajasekharan, 2010).

Many welders in Nigeria set up shop by the side of the road, putting them at risk for collisions with swerving automobiles or trucks or drunk drivers. They are also more likely to trip and fall due to machinery, cables, machineries, and tracks that may be on the floor, which can result in mishaps (Yetunde *et al.*, 2018). These are just a few of the risks that must be identified and addressed in order to lower the risks related to welding. The study's objectives were to examine welders' awareness of safety procedures and their exposure to risk in Minna Metropolis in order to offer recommendations for enhancing their occupational health and safety.

II. RESEARCH METHODOLOGY

The study was conducted in Minna metropolis, north-central Nigeria. The study population comprised welders and welding shops within the metropolis. A descriptive cross-sectional design was used for the study. A systematic sampling technique was used to select 66 welding workshops from a pool of 130 workshops within Minna metropolis. Information about each workshop was collected using a self-structured questionnaire. The data collected was analyzed using SPSS software version 16 and presented using frequency tables, percentages and charts.

III. RESULTS AND DISCUSSIONS

Table 1 shows that manual handling, noise/vibration, and fumes have the highest frequencies among the hazards found in the workshops, with respective frequencies of 63 (95.5%), 62 (93.90%), and 65 (98.50%), while asphyxiant gases, compressed gases, and fires have the lowest frequencies, with respective values of 3 (4.50%), 6 (9.10%), and 7 (10.60%). Table 2 shows all 63 (95.50%) workshops were adequately ventilated and 64 (97%) were well-illuminated. Meanwhile, 9 (13.60%) out of the few shops that do gas welding responded that they usually stopped work when perceive smell of gas.

However, out of 66 (100%) workshops, only 8 (12.10%) responded that their employees are always protected from arc flash during welding, and few of the workshops assessed were arranged, tidy, possess fire extinguishers, possess first aid boxes and properly label hazardous substances. Only 58 (87.90%) workshops provided goggles for the workers while very few of them make provision for helmet, apron and hearing protection. Almost all the workshops assessed have their welding activities carried out in an open area. Figure 1 shows the level of understanding of employees in the workshops on occupational health

and safety as better 53 (80.30%), good 41 (62.12%) and poor 6 (9.10%) respectively.

Table 1: Assessment of occupational hazards present in the workshops

Hazards	Frequency (n = 66)	Percentage (%)
Noise and vibration	62	93.90
Manual handling	63	95.50
Fumes	65	98.50
Heat stress	31	47.00
Hazardous substances	28	42.40
Burns	26	39.40
Electric shock	17	25.80
Fires	7	10.60
Compressed gases	6	9.10
Asphyxiant gases	3	4.50

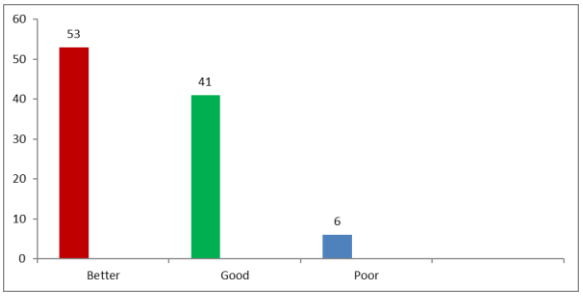

Figure 1: Understanding of Employees on Health and Safety practices

Table 2: Safety measures practiced among welding workshops

Safety measures	Frequency (n= 66)	Percentage (%)
Work area		
Adequate ventilation of workshop	63	95.50
Work areas well-lit	64	97.00
Work stops if there is smell of gas	9	13.60
Protection of employees from arc flash	8	12.10
Proper arrangement of workshop	4	6.10
Tidiness of workshop	12	18.20
Display of danger signs	5	7.60
Availability of First Aid at all times	6	9.10
Labeling of hazardous materials	7	10.60
Availability of fire extinguishers	4	6.10
Basic safety equipment provided by the employer		
Goggles	58	87.90
Facemask	18	27.30
Overalls	5	7.60
Gloves	4	6.10
Apron	6	9.10
Helmet	5	7.60
Hearing protection	3	4.50
Welding area		
Open area outside	63	95.50

This study was conducted to evaluate the workplace risks, hazards, and safety procedures in welding shops located in the Minna metropolitan. The amount of time one is exposed to welding gases and fumes, the type of welding performed, the working environment, and the protective measures taken typically influence the health hazards connected with them (Christopher, 2017).

The findings of this study showed that among the dangers reported in the study's workshops, manual handling, noise/vibration, and fumes were the most frequently noted, whereas asphyxiant gases, compressed gases, and fires were less frequently mentioned. This is similar to the risks mentioned in the AFSCME brochure on welding, which listed fumes, asphyxiant gases, pressurized gases, electric shocks, etc. as some of the key risks present in welding workshops (Beyene, Tetemke and Yetum, 2019).

Few gas welding workshops reported that work would halt when the smell of gas was detected, and the majority of surrounding workers were not shielded from arc flash. The absence of an adequate safety culture in the workshops indicates a risk for fire outbreaks and uncontrolled inhalation of toxic fumes, both of which may result in acute and chronic health

effects like metal fume fever and lung cancer. This could put the workshop at risk for these problems as well as lung cancer and acute health effects like them like them (DelaCruz, Tanoue and Matthay, 2011).

Regarding workplace safety procedures, it is laudable that virtually all of the workspaces were adequately lighted and that all of the workshops had good ventilation.

However, few of the stores were neat or well-organized. Few of the stores had first aid kits, fire extinguishers, or properly labeled hazardous materials. This is a bad practice because every workshop needs to have access to fire extinguishers in order to put out any potential fires. The majority of the workshops offered workers eyewear, but very few of the ones evaluated offered a helmet, apron, or hearing protection. Additionally, this poses a threat to the health of the workers, and the owners of the workshops are blatantly careless.

However, it is admirable that nearly all of the employees wore some sort of PPE while at work. The study found that respondents were generally aware of the health risks connected to the welding profession. The majority of the respondents had a long employment history, which may account for this encouraging conclusion. However, a similar study on welders in Aksum and Adwa Towns, Tigray Region, Ethiopia found a far greater degree of awareness (Beyene, Tetemke and Yetum, 2019).

CONCLUSION

According to this study, manual metal arc welding (electric) was done in almost all of the workshops, and the major dangers found in the welding workshops were manual handling of welding equipment, noise, vibration, and pollutants. Even though there was strong environmental management, including proper lighting and ventilation, the PPE was not provided in a sufficient manner. It is advised that the welders' association, local and state governments maintain an ongoing education campaign for welders on occupational risks, suitable environmental control measures, and the provision and proper use of various PPE on a regular basis. Governments at all level could sell safety equipment to welders at reduced prices to make it easily accessible. Governments at the local and state levels ought to implement a plan that would pay welders who annually avoid work-related accidents.

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