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Mitigation of Dangers in the Practice of Arc and Oxy-Gas Welding in Sokoto, Nigeria

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Abstract: In this research, an attempt is made to explore into the potential dangers that the practitioners of welding activities are posed to in the welding activities. 200 questionnaires were administered across parts of four (4) Local Government Areas that make up Sokoto Metropolis of Nigeria, Sokoto North, Sokoto South, Wamakko and Dange-Shuni Local Government Areas. This was aimed at collecting data from welding practitioners on their adherences to safety precautions in the practice welding activities. 195 out 200 administered questionnaires were retrieved and analysed. The results of the analysis revealed that,the majority of welding practitioners in the metropolis lacks the basic education about the code of practice in welding and neglect most necessary safety precautions which arose due to lack of regulations and enforcement of adherences to codes by any governmental agency. It was then recommended that government should regulate, enforce adherences to codes and support the practitioners within the metropolis.
Key Words: Welding, Danger, Electric Shock, Oxy-Gas, Fume.

1.0 Introduction

Welding operations present several hazards to both those undertaking its activity and others within the surrounding. Welding activities can be said to be among the jobs that contribute to accidents and diseases related to work in the developing countries (Tadesse et al, 2016). Therefore, it's of topmost importance to be noted by those partaking in these welding activities to be aware of the risks and hazards posed by welding, and thus understand what necessary precautions they ought to take for the purpose of preventing or mitigating these accidents and diseases. Welding is defined as a materials joining process used in making welds. Welding, cutting, and brazing are activities that pose combination of dangers to both safety and wellbeing of workers and others in a wide variety of welding industries. Protecting the workers when performing welding operations depends on understanding of the hazards involved and the proper ways to control them. The Control of welding hazards includes actions such as avoiding eye injuries, respiratory protection, and having ventilation at the work environment, use of protective cloths, and the use of proper equipment that gives safety. The health effects of welding exposures are difficult to list, because the fumes may contain different substances that are harmful. The Code of Practice grouped welding hazards specifically in arc welding into the following categories; fire and explosion hazards, electrical hazards, physical hazards, respiratory hazards and other hazards in welding activities (COP, 2002).

Welding is the process of joining two different objects by means of melting their surfaces or edges together. This is carried out by heating the metals until a molten puddle is formed. Usually, more metal is added to the mix by means of an other metals known as fillers. Welds are most commonly done on like metals. If done properly, the weld will be as strong as the metals that were joined.

Cutting means just what the term implies: cutting metals. It refers to situation where the welder removes or severs a piece of metal in to different pieces, instead of bonding them together.

Brazing is the process of joining two different metal objects with the use of a third dissimilar filler metal. The two objects are bonded together by means of wetting the surfaces of metals to be joined with molten filler metal and holding them together until the bond becomes solidified. This research is aimed at appraising the rate at which these variety of workshops available in Sokoto metropolis are vulnerable to such hazards and how the workers are managing the numerous hazards involved.

2.0 Literature Review

2.1 Welding Hazards

Welding is considered to be one of the most dangerous profession due to a number of reasons which includes various factors that jeopardize the welder's health, such as temperature, burns, radiation, noise, gas emission, and electric shock and as welllarge varieties in the chemical compositions from the metal vapors that results when welding activities are taking place. The particles and gas emitted during the welding process are considered to be the most harmful when compared to other reactions that results after the welding activities.

Also among the major hazards associated with the welding activities which affects human health are mostly smoke and gas. Summarily, dangers that exist in welding activities includes; electrical shock, fire and explosions, burns as a result of splashes of molten metal, eyes and skin diseases as a result of ultraviolet emissions, heat radiation, effects and effects that has to do with powerful noise during plasma arc welding (Hong and Ghobakhlo, 2014). Electric shock occurs if an individual touch life wires or any conductor connected to life wire in the area where welding operation is being carried out. This can result to injuries that are capable of causing death. Welding process can generate a heat that can raise up as 10,000 Degree Fahrenheit. This is sufficient to ignite flame or fire if safety precautions are not considered. This can extend up to 30 meters from welding zones and is also capable to spike explosion. Welders are more prone to skin related problems, as reported symptoms of skin irritation and erythema, as shown in a research study that shows Skin diseases are seen in welders as far as 74.3% in many scores of skin problems and most of the welders are suffering from a burns due to the inability of handling welding equipment (Wanjari et al, 2020).

Fume produced during welding comprises solid particles, usually less than 1.0 μm in size, formed by condensation and oxidation of the vaporized metal. These particles are capable of being deposited in the gas-exchange region of the lungs. Prolonged exposure to welding fumes and gases at high concentrations can cause a number of diseases such as; sideros is (iron oxide), metal fume fever (zinc oxide, copper, aluminum, magnesium oxide), disordersin nervous system (manganese), respiratory system irritation, eye effects, chest pain, kidney damage (cadmium oxide, fluorides), irritation of nose and throat, fluid in the lungs (cadmium oxide, fluorides, ozone, nitrogen oxide), hemorrhage (ozone),cancer (cadmium oxide, nickel, chromium (VI)), dermatitis, eczema (nickel, chromium (VI)), problems associated with bone and joint (fluorides), dizziness and headaches (HRSD, 2000).

Hot environmental conditions include air temperature, radiant heat, humidity and air movement. the exposure to which in combination with the internal body heat due to physical activity and clothing requirements may lead to some health disorders or even heat-related illnesses. The commonest symptoms of the body responses to are sweating, discontinued sweating, increased heart rate, increased body temperature, urinating less frequently than normal, small volume of dark-colored urine and irritability (HRSD, 2000).

2.2 Researches in Welding hazards

Mgonja (2017) made a review on the Effects of Arc Welding Hazards to Welders and People Surrounding the Welding Area. His conclusion was that the review has shown that welding profession is very dangerous but, not all those engaging in welding activities are very much aware of all these dangers. It's even worsen to those who surround the welding area and have nothing to do with welding activities.

Budhathoki et al., (2014) conducted research on Awareness of occupational hazards and use of safety measures among welders in which a cross-sectional study of 300 welders were selected by simple random sampling from three districts of eastern Nepal and was conducted using a semi-structured questionnaire. Data regarding age, levels of education, duration of employment, awareness of dangers in welding, safety precautions and the actual employment of safety measures were recorded. The results obtained shows that, Overall, 272 (90.7%) welders were aware of at least one danger of welding and a similar proportion of welders were aware of need to use at least one Personal Protective Equipment (PPE). However, only 47.7% used one or more types of PPE.

A work site-based cross-sectional study was conducted among welding employees at Lideta Sub-City, Addis Ababa, Ethiopia by Tadesse et al., (2016) in which Stratified sampling followed by simple random sampling techniques were used to select the study participants. A pilot tested and structured questionnaire was used in collecting data and multivariable analyses were used to see the effect of explanatory variables on the workers' awareness of occupational hazards. They obtained results in accordance to their criteria of awareness that revealed that, 86.5 % of surveyed employers were seen to be aware of occupational hazards which showed that the level at which welders are aware of occupational hazards was very high. However, this does not mean that there shouldn't be need to further strengthen the safety measures as significant number of the employers are in need of more awareness.

Wanjari and Wankhede (2020) conducted an investigation on Occupational Hazards Associated with Welding Work That Influence Health Status of Welders and asserted that in terms of morbidity classification, it has been found that 21.3% of welders and 6% of non-welders have at minimum of one morbidity, including hypertension or diabetes. There was recorded hypertension among 12.6% of welders as well as 0.7% of non-welder.31 An engagement of younger age groups indicates an early age internship at the start of the job through hands-on coaching from trained welders. Approximately 85.3% of respondents were married, a stronger correlation in India.32 Frequent self-reported effects after injuries included skin conditions (74.3%), and arc-related issues (61.3%), asthma complications (46.7%), while the least frequent condition was hearing difficulties

(35.7%). Skin, eye, and respiratory morbidity are among the common health hazards that have been associated with several studies.

2.3 Study Area

This study was conducted in selected local government areas of Sokoto State, Nigeria. Sokoto State, located in the North-west Geo-Political Zone of Nigeria, was created in 1976 after Niger State was created out of the North-western States, which has existed since 1967. It is located within the Sudan Savannah zone between latitudes 13°35'N to 14°0'N and longitudes 4°E to 6°40'E. It shares borders with the Niger Republic to the North, Kebbi state to the West, and Zamfara state to the East and South. It has twenty-three (23) local government areas, namely Sokoto-North, Sokoto-South,Binji, Sabon-Birni,Dange-shuni, Gada, Gudu, Gawabawa, Illela, Goronyo,Isa, Tambuwal,Kware, Kebbe, Bodinga,Rabah, Shagari, Silame, Tangaza, Tureta, Wamakko, Wurno, and Yabo.According to 2006 census, Sokoto State has a population of 3,696,999 million people (Yanda and Dalhatu, 2020). Both primary and secondary sources of data were employed for this research. The research was conducted in areas within four local governments which include. Sokoto North, Sokoto South, Wamakko and Dange-Shuni Local Government Areas. Figure 1 presents a map of showing Sokoto State of Nigeria.

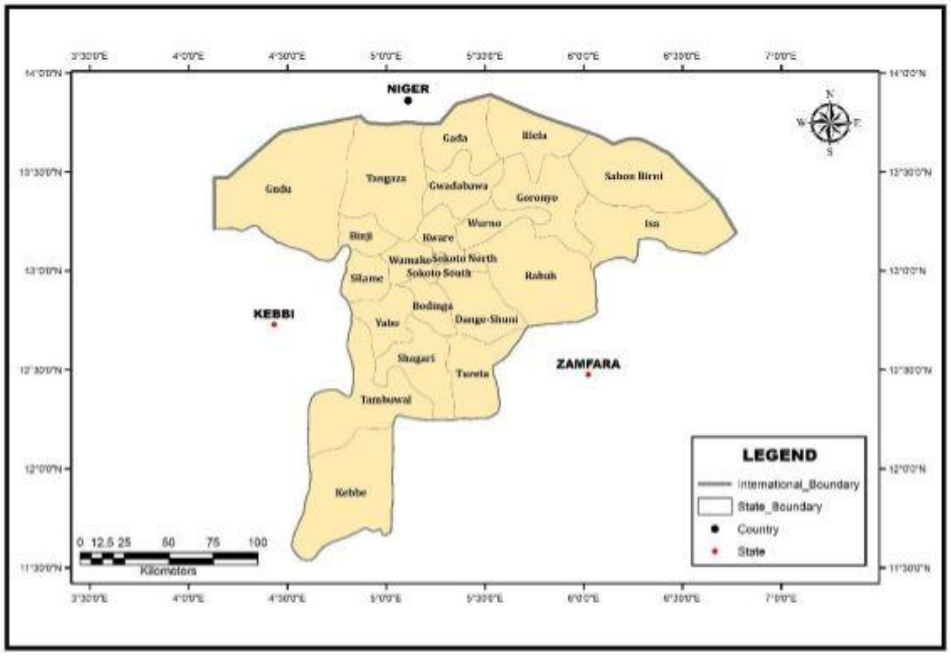

Figure 1: Map of Sokoto State (Yanda and Dalhatu, 2020)

3.0 Materials and Methods

The instruments for data collection for the research are questionnaires, face-to-face interview and personal observations. The data collected was analyzed and possible recommendations on ways to manage, prevent or reduce such hazards were given. A cross-sectional study of 200 welders selected by simple random sampling, 50 from each of the four local government areas (Sokoto North, Sokoto South, Wamakko and Dange-Shuni) within Sokoto metropolis was conducted using a semi-structured questionnaire. Data regarding gender, age, duration of work, nature and type of welding, location of workplace, awareness of hazards, safety precautions to be taken and the actual utilization of these precautions were recorded.

4.0 Results

A total of 195 questionnaires were retrieved back out of the 200 administered. Tables 1, 2 and 3 presents the information gathered from the survey. Discussions were then made from the responses received from respondents across the four local government areas selected. Conclusions and recommendations were also made.

Table 1: Welders' Basic Requirement

S/N	Description	Number of Welders in Affirmation	Percentage (%)
1.	Formal Training	103	53
2.	Union Membership	45	23
3.	Welding Permit	30	15.4
4.	Welding Document & Safety Code	20	10.3

Source: (Field Work, 2021)

Table 2: Welders' Awareness and Involvement in Welding Hazards

S/N	Description	Number of Welders in Affirmation	Percentage (%)
1.	Awareness about the actual welding hazards	50	25.6
2.	Involvement in welding hazard	75	47
3.	Involvement of someone in welding hazard in the workshop	39	24.5

Source: (Field Work, 2021)

Table 3: Welders' Precautionary Measures

S/N	Description	Number of Welders in Affirmation	Percentage (%)
1.	Use of eye glasses to weld	146	74.9
2.	Use of Hearing Protective Device	25	12.8
3.	Use of Respiratory or nose mask	10	5.1
4.	Use of radiation/fire resistance cloth	2	1.0
5.	Use of boot and hand gloves	7	3.6
6.	Possession of fire extinguisher	3	1.5
7.	Possession of First Aid Box	11	5.6
8.	Cables connection with joints	39	20
9.	Cylinder legibly marked	4	2.1
10.	Leakages in gas hoses	15	7.7
11.	Cylinder position vertically during weld & storage	5	2.6
12.	35 feet distance between welding area and any combustible material	20	10.3
13.	Enough Ventilation in workplace	30	15.4
14.	Inspection of welding equipment before beginning of work daily	40	20.5

Source: (Field Work, 2021)

4.1 Discussions

From table 1 it can be seen that an insignificant percentage of welders investigated (10.3%) possesses welding documents and safety codes in the practice of welding. This results to limited awareness about the safety of personnel in welding activities. Table 3 on the other hand also revealed the lack of adherence the majority of welders to the basic welding precautions. For instance, only 5% of 195 welders wears nose mask, 1% of them use radiation resistance cloth, 3.6% uses hand gloves during welding, and 20% have their electric cables with joints here and there. These and other laxities during welding activities makes them and other peoples vulnerable to dangers of welding activities in the metropolis. It is obviously clear that such attitudes are not in line with the provision the Code Practice for Safety and Health at Welding Workshops.

5.0 Conclusions

From the findings of this research, the following can be concluded;

i. that majority of those engaging in welding activities in Sokoto Metropolis do not have awareness about basic welding safety measures to be taken.
ii. that most of welders do not adhere to safety precautions in welding activities.
iii. Welding activities are not being regulated by any Government agency in Sokoto metropolis.
iv. that welding activities is posing serious health challenges to the populace of Sokoto metropolis.

6.0 Recommendations

Based on the aforementioned conclusions, the following recommendations are made;

i. Government should properly regulate welding activities in the metropolis with aim of enforcing proper adherence to safety precautions during welding activities for the purpose of mitigating hazards.
ii. There should be a greater awareness within welding practitioners on the code of practice for safety in welding activities.
iii. More support should be given,by the Government, to these practitioners in terms of funds to enable them acquire better tools and equipment for the welding activities.

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