ASSESSMENT OF THE USE OF SAFETY DEVICES BY WELDERS IN OSOGBO, NIGERIA

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ABSTRACT

This research work assessed the use of safety devices in the prevention of occupational hazards among welders in Osogbo Osun state, Nigeria. It is a non experimental descriptive study comprising 110 consenting welders as sample. Structured questionnaire was administered to the participants. The results showed that respondents’ ages ranged from 20 – 60 years with a mean 29 ± 2.54. The results revealed that 107 (97.3%) of the respondents were male while 3 (2.7%) were female. Three hypotheses were tested using chi square tests. Results of the first hypothesis showed that the subjects lack adequate knowledge on the use of safety devices and their influence on the occurrence of occupational hazards. Also, the results of the second hypothesis showed that there is significant difference between the educational qualification of welders and the use of safety devices. Those welders with post secondary education complied more in the use of safety devices than their colleagues with lower educational status. Similarly, the results of the third hypothesis showed that there is significant difference between the working experience of welders and the use of safety devices. It was therefore suggested that welders should be health educated on the concepts of safety devices and occupational hazards.

INTRODUCTION

In Nigeria, welding is an informally learnt occupation. Informal sector contributes significantly to the economic development of the country. The operators of the sector are artisans with mainly primary education, and sometimes no formal education at all. The artisans are found in mining and quarrying (excluding petroleum), small scale manufacturing companies, building and construction, woodwork and furniture making, tailoring, electronics and electrical gadgets repairing and among others (Ekpo, 2012). According to Rongo (2011), activities in the informal sector in Nigeria are difficult to measure; the artisans are highly dynamic and contribute substantially to the general growth of the economy and personal income. However, most times they operate outside the purview of government regulation. The sector encompass a wide range of small scale, largely self employed activities which may be invisible, irregular, non structured and sometimes their mode of operation are parallel with that of formally trained professionals. In the work of Nwaka (2009), it was found out that informal sector plays an important role in employment creation and poverty alleviation by producing income to unskilled and semi-skilled workers who otherwise would be unemployed. The work further reveals that the International Labour Organisation estimated the proportion of the urban workforce engaged in the informal sector to be highest in sub-saharan Africa and they account for more than 50% of urban employment in two-thirds of the countries surveyed in 1999. Rongo (2011) observed that many informal sector workers are urban poor and lack access to medical care as they are not covered by employment legislation. They also lack protective equipment which is the major reason for their exposure to occupational hazards and subsequent poor health condition. Welders are particularly observed to be more prone to occupational hazards which cause many health problems like impaired pulmonary function, chronic bronchitis and interstitial lung disease.

A welder (also welder, which is the term which distinguishes the tradesman from the equipment used to make welds) is a tradesman who specializes in welding materials together. The materials to be joined can be metal (such as steel, aluminum, brass, stainless steel e.t.c) or varieties of plastic or polymer. Allen (2009) further stated that the welding process best suited to joining two pieces of metal depends on the physical properties of the metal, the specific use to which they are applied and the production facilities available. Also, welders typically should pay attention to detail and have some technical knowledge about the materials being joined and the best practices in the field. The hazards expose welders to asthma, pneumonitis, pneumoconiosis, lung cancer, photokeratitis, eye burns, cataracts, maculopathy and impaired human immunity. Other health problems associated with the welding work are erythema, pterygium, short and long term injury to the skin, non melanocytic skin cancer, malignant melanoma, reduced fertility and decreased volume of semen and sperm count. Erdal and Berman (2008) identified various physical hazards associated with the welding process. 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. Twin et al. (2008) further stated that sound as high as 120 decibels (dB) is produced by welding machine and this is very dangerous to the hearing organ. Exposure to high levels of noise (>90 dB) for an eight hour period 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 deafness, fatigue and nervousness may also result. It was further opined that welding machines produce vibrations which may give rise to injury to soft tissue and the digital circulation of the hand and arm which may result in a condition known as hand-arm vibration syndrome (HAVS) which have symptoms similar to that of Reynaud’s syndrome i.e. blanding of the fingers (Sobaszech et al., 2010).

According to the Canadian center for occupational health and safety (2011), welding arcs give off radiation over a broad range of wavelengths from 200-1400 nm. This includes ultraviolet radiation (200-400 nm), visible light (400-700 nm) and infrared radiation (700-1400 nm). Certain types of ultraviolet radiation can produce an injury to the surface and mucus membrane of the eye called ‘arc eye’, ‘welder’s eye’ or ‘arc flash’. Also the brightness of the weld arc can also lead to the optic condition, arc eye or photokeratitis in which ultraviolet light causes the inflammation of the cornea and can burn the retina of the eyes. Apart from producing arc eye, long term exposure to ultraviolet light can produce cataracts. It was further stated that visible light from welding processes can overwhelm the ability of the iris of the eye to close sufficiently and rapidly enough to limit the brightness of the light reaching the retina. The result is that the light is temporarily blinding and fatiguing to the eye.

A serious concern is the ‘blue light hazard’ which is the temporary or permanent scarring of the retina due to its sensitivity to blue light, around 440 nm wavelength and blindness may result. Prabhakara (2002) also stated that long term effects of radiation manifest themselves as malignant changes, genetic changes and damage, blood disorders like leukemia, dermatitis and sterility. The work stated further that welders are often exposed to dangerous gases and particulate matter processes like flux cored arc welding and shielded metal arc welding produce smoke containing particles of various types which in some cases can lead to medical conditions like metal fume fever. Inhalation of iron dusts can also cause respiratory changes while chromium dusts causes skin lesions and perforation of nasal septum. Blunt and Balchin (2005) also stated that many processes produce fumes and various gases most commonly carbon dioxide and ozone that can prove dangers if ventilation is inadequate and breathing in these gases and fumes is very dangerous. As a result of the various risks and hazards associated with the welding process, welding safety thus becomes a most important subject as the occupation deals with exploitation of energetic means capable of yielding high temperature. However, with the use of new technology and proper protection, the risk of injury and death associated with the welding profession can be greatly reduced. This proper protection comes as the use of safety devices or personal protective equipments by welders.

According to the American Welding Society (2012), safety devices refer to protective clothing, helmets, goggles, garment or equipment designed to protect the wearer’s body from injury by blunt impacts, electrical hazards, heat, chemicals and infection for job related safety and health purposes also in sports, martial arts and combat etc. Safety devices also refer to personal protective equipments (PPE). Welders must wear and use suitable protective equipments to protect them against hazards such as burns, sparks, spatter, electric shock and radiation. The use of personal protective equipment is a good and safe practice and may be required by regulatory agencies for the occupational safety and health administration. Welding and cutting can produce hazards such as sparks, radiation (infrared, ultraviolet and blue light), stag, heat, hot metal, fumes and gas, spatter as well as electric shock. Since these hazards may result in death, it is important to use personal protective equipments at all times. The Virginia polytechnic institute (2011) described the various types of safety devices available for the use of welders as follows and these include safety glasses, safety goggles, shields, helmets, gloves, protective clothing, caps and hats. Others are foot wear, leg wear, ear plugs and ear muffs, Erhabor et al., (2009) reported that 40.9% of subjects working in welding industry were suffering from restrictive lung disease (interstitial lung disease) and the most frequent symptoms found among welding workers were obstructive lung diseases.

According to Sabitu et al., (2009) in a study carried out on awareness of occupational hazards and utilization of safety measures among welders in Kaduna metropolis, it was discovered that 85.3% of the subjects had experienced one or more work-related accidents and occupational hazards. The most common injuries sustained were cuts or injuries to hands or fingers (38.0%), back or waist pain (1%), arc eye injuries due to foreign bodies in the eye (17.0%), burns (14.0%), hearing impairment (7.0%), fractures (4.0%) and amputation (1.0%). It was also observed that there was sub-optimal utilization of protective measures against these occupational hazards with only 34.2% of the welders using one or more types of protective devices. The more frequently used protective devices were eye goggles (60.9%), hand gloves (50.3%), and boots (34.5%). The importance of safety devices cannot be undermined in the promotion of good occupational health as well as reduction of the impact of occupational hazards among welders. The process of welding requires a lot of energy to melt or fuse the metals resulting in release of heat and energy. This increases the risk of injuries and health hazards to the welders. Neglect or ignorance has been observed among the practitioners of the welding occupation as they, most times, neglect or avoid the use of safety devices even when they are well informed about their importance in preventing the occupational health hazards.

In a study carried out by Ajayi et al., (2011) on the awareness of occupational hazards and utilization of protective devices among welders in Ile-Ife, it was observed that there was a high level of awareness of occupational hazards and protective devices among the welders; (90.6%) being higher among arc welders compared with gas welders (p<0.001). Less than half (45.9%) of the welders possessed protective eye devices. Out of these, only 9.6% made use of the device always. Some of the reasons for not using the protective eye devices include discomfort and poor visibility (13.6%) and inadequate appreciation of the necessity to wear it (12.9%). It thus becomes glaring that despite the awareness of the impact of occupational hazards, welders do not comply to the use of safety device as they are often victims of work related injuries such as burns, cuts, falls, electric shock, arc eye, blindness, deafness and exposure to radiation. This study is therefore carried out to assess the level of utilization of safety
devices by welders in Osogbo with a view to educating them on avoidance of occupational hazards of welding. The following research hypotheses were tested:

- There is no significant difference between the knowledge of welders and the use of safety devices.
- There is no significant difference between the educational qualification of welders and the use of safety devices.
- There is no significant difference between the working experience of welders and the use of safety devices.

**Conceptual framework**

According to Alligood and Tomey (2007), self care theory pointed out that self care comprises those activities performed independently by an individual to promote and maintain his/her wellbeing. The theory developed a conceptual framework and defined concepts to meet client’s own identified goal of nursing which is to render the client or members of his family capable of meeting the client’s self care needs. This model was adapted for this study.

The following are major assumptions basic to the theory of self care:

- People should be self reliant and responsible for their own care and others in their family needing care.
- People are distinct individual.
- Successfully meeting universal and development of self care requisites is an important component of primary care prevention and ill health.
- A person’s knowledge of potential health problems is necessary for promoting self care behaviours.
- Self care and dependent care are behaviours learnt within a socio cultural context.

The theory of self care includes self care, self care agency, therapeutic self care demand, self care requisites. The theory or model is applied to this research study because it supported the fact that human beings are responsible for their own care in all aspects. It also described that though an individual is self reliant, the nurse can also help meet the self care needs of his/her client through guiding, teaching, supporting or providing the environment to promote the client’s ability. The theory was also applied to this study because safety devices are for welder’s personal use and compliance to their use strongly determines the prevention of occupational hazards among the welders.

**MATERIALS AND METHODS**

**Location and Sampling**

The study was carried out at Osogbo, Osun state, Nigeria. Osogbo is an agrarian community with a population of 131,761 (National Population Commission, 2006). Some dwellers engage in vocations such as carpentry, tailoring, road side mechanic, welding among others. Using a stratified sampling method, a total of 133 welders were selected as sample size for the study.

**Instrument and Informed Consent**

A self designed questionnaire was used as instrument as data gathering instrument. This comprised two sections. Section A consisted of demographic data while section B tested the respondent’s knowledge on the awareness of occupational hazards and the use of safety devices. After obtaining permission for the study from the welders, questionnaires were administered to 133 of them in their shop but only 110 returned the fully completed questionnaires.

**Data Analysis**

These were analyzed with the aid of the statistical package for social sciences (version 17) and simple results were generated with the aid of simple statistics such as mean, frequency, tables and figures. Chi-square tests were also used in testing the hypotheses at 0.05 level of significance.

**RESULTS**

The respondents’ ages ranged from 20 – 60 years with a mean 29 ± 2.54. The results revealed that 107 (97.3%) of the respondents were male while 3 (2.7%) were female. The educational status showed that 39.1% completed primary school, 20% had post secondary education while only 24% had no formal education. The respondents’ years of experience in the job ranged from 5-20 with a mean 9 ± 3.78 years. The results further showed that 22 (20%) of the respondents said they were formally trained in welding vocation while 88 (80%) learnt by occasional watching the welding process in their uncle’s shop and they later started practicing the vocation on their own. It was shown that 99 (90%) of the respondents were satisfied with the vocation while 11 (10%) said they were not and would soon abandoned it for other vocation. Also, 87 (79.1%) of the respondents said they were trained to make use of safety devices during welding but 23 (20.9%) said their trainners did not use any safety device too. To this end, 90 (81.8%) of the respondents were using safety devices constantly during welding while 20 (18.2%) said they did not. When asked whether they have sustained welding related injury before, 88 (80%) of the respondents said yes while 22 (20%) said no. The injury sustained was major in 34 (30.9%) of the respondents while it was minor in 76 (69.1%) of them. Respondents’ opinions on the use of safety devices to prevent occupational hazards are shown in table 1.

| Table 1 Respondents’ opinion on the use of safety devices to prevent occupational hazards |
|-----------------------------------------------|-----------------|----------------|-----------------|-----------------|
| Respondents’ opinion                          | Always (%)      | Sometimes (%)  | Rarely (%)      | Never (%)       |
| Welder should use safety devices while working | 42(38.2)        | 46(41.8)       | 11(10)          | 11(10)          |
| Use of safety devices delay completion of work | 12(10.9)        | 34(30.9)       | 31(28.2)        | 33(30)          |
| Experienced welders should use safety devices | 44(40)          | 43(39.1)       | 11(10)          | 12 (10.9)       |
| Use of safety devices is a mere decoration of body to brag on the job and it’s therefore unnecessary | 12(10.9)        | 33(30)         | 54(49.1)        | 1(10)           |
| Use of safety devices in itself causes work related injury | 11(10)          | 11(10)         | 34(30.9)        | 54(49.1)        |

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Respondents views on the impact of the use of safety devices in preventing occupational hazards among welders are represented in Table 2.

**Testing of Hypotheses**

**Hypothesis 1:** There is no significant difference between the knowledge of welders and the use of safety devices. 

\[ \chi^2_{\text{Calculated}} = 4.230, \chi^2_{\text{table}} = 1.063, \text{df}=1, P=0.05 \]

Inference: Since the table value (1.063) is less than calculated value (4.230) at 0.05 level of significant, it implies that there is significant difference between the educational qualification of welders and the use of safety devices. Therefore the null hypothesis is significant and hence rejected.

**Hypothesis 2:** There is no significant difference between the working experience of welders and the use of safety devices. 

\[ \chi^2_{\text{Calculated}} = 6.050, \chi^2_{\text{table}} = 1.462, \text{df}=3, P=0.05 \]

Inference: Since the table value (1.462) is less than calculated value (6.050) at 0.05 level of significant, it implies that there is significant difference between the working experience of welders and the use of safety devices. Therefore the null hypothesis is significant and hence rejected.

**Hypothesis 3:** There is no significant difference between the lack of formal training affects the use of safety devices. 

\[ \chi^2_{\text{Calculated}} = 6.050, \chi^2_{\text{table}} = 1.462, \text{df}=3, P=0.05 \]

Inference: Since the table value (1.462) is less than calculated value (6.050) at 0.05 level of significant, it implies that there is significant difference between the lack of formal training affects the use of safety devices. Therefore the null hypothesis is significant and hence rejected.
It was found out that the occurrence of work related accidents was rampant among the subjects with few years of experience and among those with relatively short period of training in welding. This supported the views of (Sabitu et al., 2009 and Hamel, 2011) opined that the inconsistency in the training of welders accounted for poor knowledge of the hazards inherent in the job and the use of safety devices for prevention as demonstrated by some welders. In the present study, it was discovered that with subjects who were formally trained had a better understanding of the hazards of the job and the use of various safety devices for preventing the hazards while their colleagues who learnt the job informally had just sketchy ideas of the hazards and the preventive methods.

In the hypotheses tested, there was significant difference between the knowledge of welders and the use of safety devices. The more knowledgeable the subjects were in the art of welding, the better their use of safety devices. In the second hypothesis, there was significant difference between the educational qualifications of welders and the use of safety devices. Subjects with post secondary education before one dabble into any vocation which ensures better performance and success in the vocation. Subjects with post secondary education before one dabble into any vocation which ensures better performance and success in the vocation. Overall, the results of the study justify the age long believes of formal training as the bedrock of success in any human endeavour and the acquisition of post secondary education before one dabble into any vocation which ensures better performance and success in the vocation.

### Recommendations

The following are the recommendation to ensure compliance to the use of safety devices among welders which will help a lot in the prevention of welding related hazards:

- Welders should be health educated on the concepts of safety devices and occupational hazards constantly through seminars and conferences to be organized by local and state governments on regular basis.
- Safety devices should be made readily available and accessible through sale at subsidized rates to welders by the local and state governments.
- Welders should form viable union who could monitor the use of safety devices and apprehend defaulters on regular basis for various forms of sanction.
Local and state governments should institute a programme that could give yearly financial rewards to welders who maintain the work-related accident free working year.

References


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