International Journal of Research and Review
Vol.7; Issue: 1; January 2020
Website: www.ijrrjournal.com
Original Research Article *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Compliance in the Use of Personal Protective Equipment by Welders in Delta State, Nigeria

Obarhoro O.I[1], Nwufo C.R[1], Nworu B[1], Ibe S.N.I[1], Iwuala C.C[1], Ede A[1], Ebirim C.I.C[1], Iwuoha G[1], Azuamah Y.C[2]

[1]Department of Public Health, Federal University of Technology, Owerri, Nigeria
[2]Department of Optometry, Federal University of Technology, Owerri, Nigeria

Corresponding Author: Obarhoro O.I

ABSTRACT

Welders are exposed to physical and chemical hazards that can lead to injuries. This study was carried out in Delta State, Nigeria to investigate the compliance of welders toward the use of personal protective equipment required for their work. The study was a descriptive study carried out in Delta State, Southern Nigeria. The multi-stage sampling technique was used to select the subjects used for this study. A well-structured questionnaire was used to obtain information from the welders. Data collected was uploaded into the Statistical package for Social Sciences (SPSS) version 21 and analysis was done using the chi-square at 0.05 level of significance. A total of 390 welders were interviewed in this study. Results on the compliance of welders with recommended guidelines for enforcement of the use of personal protective equipment showed that 244 (62.6%) were aware of the compliance guidelines on the use of personal protective equipment, 146(37.4%) were not; 200(82%) of the welders complied with the recommended guidelines on the use of personal protective equipment. On the barrier to the use of PPE, 140(35.2%) reported lack of training on the use of PPE, followed by inadequate quantity of PPE with 80(20.5%). For the PPE used, 225(57.7%) said they used eye goggles, 70(17.9%) said coverall and the least was nose mask with 10(2.6%). The data was analyzed with chi-square test and showed that there is statistically significant relationship (X^2 = 233.893[a]; DF = 3; P < 0.05) between age group and use of personal protective equipment among welders. It also showed significant relationship (X^2 = 233.893[a]; DF = 3; P < 0.05) between level of education and use of personal protective equipment among welders. In conclusion, there is low level of knowledge among welders due to their poor educational background on the use of personal protective equipment. Health education on welding and its health effects was recommended for welders.

Keywords: Welders, Personal Protective Equipment, Hazards, Compliance, Guidelines

INTRODUCTION

Welding is a process of joining two or more similar pieces of material into one continuous body. [1] Welding works are the commonest types of work practiced in the less industrialized world. [2] Welding is a widely used process; it is one of the most intense artificial sources of invisible and visible optical radiation, which the ultraviolet rays, is the main actinic component. In the twenty-first century; it is still a common and a highly skilled occupation. [3] There are two major types of welding: shielded metal arc and gas (oxyacetylene) welding; [4] both of which are associated with adverse health effects from chemical and physical agents. The metal work usually takes place at workshop which is a designated work environment with different machinery, and work tools. The operations include welding, fabrication, casting, forging, machining and fitting, which involves working with hot metals, sharp objects, working with infra-red light, combustible gas, hazardous tools and equipment; as a result of the nature of the occupation, workers sometimes have accidents due to fire out-break, injuries from

burns, cuts, electric shock, infections from inhaling of fumes, blindness from lighting and sparkles.

Common chemical and physical hazards include fumes, gases and ultraviolet radiation (UVR) respectively, all of which are associated with adverse effects on the eye. [5] Although fumes and gases can cause eye irritation when welding is done in confined spaces, UVR emitted by the electric arc is the most harmful to the eye. Therefore, the process of welding is potentially hazardous to the eye if adequate eye protective devices are not worn. Substantial evidence exists to implicate UVR as the primary, or at least a contributing cause to a number of ocular conditions. [2] Long term chronic exposure to ultraviolet radiation is associated with conditions like pterygia, pingueculae, band-shaped keratopathy and climatic droplet keratopathy. [6] Thermal burns from hot metal can also occur when welding and contribute to the risk of developing skin and ocular damage. [7] Since hazards may result in welding process, it is important to use personal protective equipment at all times. The Virginia Polytechnic Institute [8] described the various types of safety devices available for use among welders as follows; safety glasses, safety goggles, shields, helmets, gloves, protective clothing, caps and hats. Others include foot wear, leg wear, ear plugs and ear muffs. According to Eyayo, [9] the health of workers in any occupation like welding, should aim at protecting and maintaining the physical, psychological and social health of individuals and their families. It can also be viewed as the study of factors or conditions influencing the health and well-being of workers not only in the place of work but also at home with the aim of promoting health, safety and welfare of the workers and their family.

The majority of urban informal sector workers in Nigeria live in slums, and lack basic health and welfare services and social protection. They work in an unhealthy and unsafe work environment. For most informal sector operators, their home and workplace are one and the same place. Vulnerability to diseases and poor health result from a combination of undesirable living and working conditions. Many of the small-scale enterprises like the welders operate in ramshackle structures, road-side lack sanitary facilities or potable water, and have poor waste disposals. [9] Rongo [10] opines that it is a substance or material including a hazardous substance which is capable of poisoning an unreasonable risk to health, safety and properly. Oluwagbemi [11] perceived that workplace hazards are common in all parts of the world, most especially in the developing countries like Nigeria where there is inadequate recognition of causes of hazards, poor record keeping and reporting mechanism. Every occupation has its own hazard and they are responsible for most cases of accidents, illness and disease in many work places. Sabitu et al. [12] stated that about 250 million cases of work – related injuries per year worldwide are being contributed by non-industrial welding especially in developing countries including Nigeria.

Park [13] stated that an industrial worker may be exposed to five types of hazards, depending upon his occupation. These include physical hazards, chemical hazards, biological hazards, mechanical hazards and psychosocial hazards. Welders are exposed to excessive noise levels, excessive heat and cold, electromagnetic fields, laser light and radiation. [13] Canadian Centre for Occupational Health and Safety [14] stated that welding arc give off radiation over a broad range of wave length from 200-1400mm. This includes ultraviolet radiation (200-400mm), visible light (400-700nm) and infrared radiation (200-140nm). The brightness of the weld arc can 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. [6] Apart from producing arc eye, long term exposure to ultraviolet light can produce cataracts. 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. When welders don't wear their personal protective equipment during work, they expose themselves to injury from the very different hazards that results from welding. This study was carried out to investigate the compliance of welders in Delta State, Nigeria toward the use of personal protective equipment required for their work.

MATERIALS AND METHODS

This study was a descriptive study carried out in Delta State, Southern Nigeria. The multi-stage sampling technique was used to select the subjects used for this study. A well-structured questionnaire was used to obtain information from the welders. Data collected was uploaded into the Statistical package for Social Sciences (SPSS) version 21 and analysis was done using the chi-square at 0.05 level of significance.

RESULTS

A total of 390 welders were interviewed in this study. Table 1 showed the socio-demographic characteristics of respondents; majority 240(61.5%) were between the age group of 26-35 years, followed by 81(20.8%) for age group of 36 – 45 years, 49(12.6%) for age group of 18 – 25 years and the least was 20(5.1%) for age group of over 46 years. In relation to gender, 380(97.4%) were male while female had only 10(2.6%).As regards to highest education attainment, majority 189(48.5%) attended secondary education, followed by primary with 121(31%), no education recorded 77(19.7%), NCE/OND had only 2(0.5%) and only 1(0.3%) had university education. Out of 390 welders interviewed, majority 183(46.9%) had 4–5 years of working experience in welding followed by 127(32.6%) for those with 0–3 years, 62(15.9%) had 6–10 years and the least was 2(0.5%) for those with more than 20 years working experience.

The results in table 2 presented the compliance with recommended guidelines for enforcement of the use of personal protective equipment. The table showed that 244(62.6%) were aware of the compliance guidelines on the use of personal protective equipment, 146(37.4%) were not; 200(82%) of the welders complied with the recommended guidelines on the use of personal protective equipment. Out of 390 welders, 250(64.1%) knew the purpose of PPEs for work and only 130(33.3%) had training in PPE use. On the question of knowing that wearing and removal of PPE is based on the manufacturers' instructions, 121(31%) supported the idea while 269(69%) were against that idea. From the result, 189(48.5%) stated that employers do enforce the use of PPE at their workplace. Only 170(43.6%) said that use of PPE promoted their work and 150(38.5%) were of the opinion that they use PPE all the time according to the indicated legislative guide instruction.

Table 3 presented the response to the use of PPE among welders. On the barrier to the use of PPE, majority 140(35.2%) reported lack of training on the use of PPE, followed by inadequate quantity of PPE with 80(20.5%), lack PPE availability with 70(17.9%), 50(12.8%) said no comfort in use of PPE and the least reported PPE is too large and easily falls of and they fell dizzy in its use with 10(2.6%). In terms of how they feel about wearing PPE, 165(42.3%) said safe and comfortable, 145(37.2%) said safe and uncomfortable, 55(14.1%) said it was safe while 25(6.4%) said uncomfortable. In regard to how the PPE affects the working condition, 295(75.6%) said personal protective equipment makes easy working condition, 70(17.9%) said it makes it harder and 25(6.4%) said stressful. For the PPE used, majority 225(57.7%) said they used eye goggles, 70(17.9%) said coverall and the least was nose mask with 10(2.6%). When asked when they wear their PPE, 201(51.5%) said they always wear

their personal protective equipment, 99(25.4%) said when the Supervisor is around and 90(23.1%) said when they feel like using it.

The data was analyzed with chi-square test and showed that there is statistically significant relationship (X^2 = 233.893[a]; DF = 3; P < 0.05) between age group and use of personal protective equipment among welders. It also showed significant relationship (X^2 = 233.893[a]; DF = 3; P < 0.05) between level of education and use of personal protective equipment among welders.

Table 1: Demographic Information of Welders

Variable	n	%
Age		
18 – 25 years	49	12.6
26 – 35 years	240	61.5
36 – 45 years	81	20.8
Over 46 years	20	5.1
Total	390	100.0
Gender		
Male	380	97.4
Female	10	2.6
Total	390	100.0
Level of Education		
Primary	121	31.0
Secondary	189	48.5
NCE/OND	2	0.5
University	1	0.3
No education	77	19.7
Total	390	100.0
Years of experience		
0–3	127	32.6
4–5	183	46.9
6–10	62	15.9
11–20	16	4.1
>20	2	0.5
Total	390	100.0

Table 2: Compliance with Recommended Guidelines on the use of Personal Protective Equipment (PPE)

Statement	Yes		No		Total
	n	%	n	%	
Aware of the recommended guidelines	244	62.6	146	37.4	390
Comply with the recommended guidelines	200	82.0	44	18.0	390
Know the purpose of PPE in the job	250	64.1	140	35.9	390
Had any training in PPE use	130	33.3	260	66.7	390
Wear and remove PPE according to manufacturers' instructions	121	31.0	269	69.0	390
Employers enforcement the use of PPE	189	48.5	201	51.5	390
Use of PPE promoted your work	170	43.6	220	56.4	390
Use PPE according to legislative guide instruction	150	38.5	240	61.5	390

Table 3: Response to the use of PPE among welders

Variables	n	(%)
Barrier to the use PPE		
Lack PPE availability	70	17.9
Inadequate quantity of PPE	80	20.5
PPE is too large and easily falls of	10	2.6
Frequent stock out	30	7.7
Lack of training on the use of PPE	140	35.9
Dizzy	10	2.6
No comfort	50	12.8
Total	390	100.0
Which one is applied to you in wearing personal protective equipment to work?		
Safe	55	14.1
Uncomfortable	25	6.4
Safe but uncomfortable	145	37.2
Safe and comfortable	165	42.3
Total	390	100.0
Personal protective equipment makes working condition		
Easy	295	75.6
Harder	70	17.9
Stressful	25	6.4
Total	390	100.0
Personal protective equipment used by welder		
Gloves	55	14.1
Eye Goggle	225	57.7
Nose mask	10	2.6
Coverall	70	17.9
Safety boots	30	7.7
Total	390	100.0
When do you wear personal protective equipment?		
Always	201	51.5
When Supervisor is around	99	25.4
When I feel like using it	90	23.1
Total	390	100.0

DISCUSSION

This study revealed that welding works are commonly practiced by men and majority of them had low level of education. They are however skilled people with no knowledge of the neurological and neurobehavioral deficits which may occur when workers are exposed to low levels of manganese (<0.2 mg/m^3) in welding fumes. [13] Based on findings of this study, it is necessary to adopt health promotional measures at workplace. This work will provide an important step towards providing a healthier workplace, especially in some areas within the country and beyond where such measures are commonly not well considered. Data generated in this study revealed that most welders had primary and secondary school level education which is in line with other studies [3,9,15] and which stated that the main reasons for which safety precautions are not adhered to would include low level of education of workers, inadequate knowledge of health hazards and unavailability of preventive measures. Personal protective equipment (PPE) plays a very important role in the health and safety of workers in all occupations and when utilized at workplace minimizes exposure to a variety of hazards. Active cooperation and compliance with the legislation guide in use personal protective equipment among welders are necessary for maximum benefits to be derived from PPE utilization. Other studies [10,12] reported a very low in use of personal protective equipment while this study recorded a moderate use of PPE and the reason may be due to increase in health awareness of the hazards associated with welding work.

For the barriers in the use of personal protective equipment, the following were reported as observed barrier and they include; lack PPE availability, inadequate quantity of PPE, lack of training on the use of PPE, lack of comfort etc. It was observed in this study that lack of training is the major issue in use of PPE. Awosan et al. [16] carried out a study on the knowledge and safety practices related to exposure to physical and chemical hazards among welders in Sokoto, Nigeria. It was concluded that low utilization of PPE and the correspondingly high prevalence of accidents and injuries despite good knowledge of welding hazards and their prevention among welders in Sokoto, Nigeria, underscore the need for government, employers and other stakeholders to promote ownership and consistent use of PPE, in addition to monitoring welders and their employers for compliance with workplace health and safety standards. In regard to hazards associated with welding works, this study revealed that personal protective equipment does protect workers from hazard of their work and the finding indicated majority of the welders in Delta State used eye goggle while working. According to Lipscomb, [17] in a study carried out on use of personal protective equipment, eye injuries are considered to be largely preventable especially if adequate eye protection is used and appropriate machine guards are positioned over obvious hazards. In a study [18] carried out on eye health of industrial workers in Enugu, Nigeria, the eye injuries encountered were mostly caused by metal chips, cement dust, fragments of woods, pieces of coal stone, and welders' arc rays, and all could have been prevented by wearing protective eye goggles and similar coverings. Also, Harris [19] supported the idea on use of PPE, because, for PPE to be effective in preventing injury in welding the personal protective equipment (PPE) such as hand gloves, safety shoe, goggles for eye protection must be of appropriate type for the hazard encountered and it must be properly fitted. WHO [20] stated that if proper precautions are not taken, hazards can cause injuries to the face, eyes and could lead to life-long disability.

In conclusion, a good number of welders in Nigeria comply with the use of PPE while working. However, there is low level of knowledge among welders due to their poor educational background on the use of personal protective equipment. It was

recommended that health education on welding and its health effects should be given to welders irrespective of the age and level of education.

REFERENCES

1. Ten-Kate T, Collins MJA. Survey of Symptoms and Eye Safety Practices among Welders. ClinExpOptom.2010; 11(73):79-85.
2. Erhabor GE, Fatusi AO,Ndububa D. Pulmonary Symptoms and Functions in Gas Welders in Ile Ife. Nigerian Medical Practitioner.2012; 10(24):99–101.
3. Howden DG, DesmeulesMJA, Saracci S, Sprince NL,Herber PI.Respiratory hazards of welding: occupational exposure characterization. Am Rev Res Dis.2008; 28(138): 1047-1075.
4. Meo SA, Al-Khlaiwi T. Health Hazards of Welding Fumes. Saudi Medical Journal. 2013; 12(24):1176-1182.
5. Erdal S,Berman L. Occupational exposure environment, risk factors and hazards awareness of metal sculptors and artist welders in the U.S. 2008; Available at:http://www.cieh.org[Retrieved November 20, 2018].
6. Klinwork GK. Chronic actinic keratopathy-a condition associated with conjunctival elastosis (pinguecula) and typified with characteristic extracellular concretions. American Journal Pathol. 2012;10(67): 327–334.
7. Ewing, MR.The Significance of a Single Injury in the Causation of Basal Cell Carcinoma of the Skin. ANZ Journal of Surgery. 2011; 41:140-147.
8. Virginia Polytechnic Institute. Occupational Safety Devices for Welders.2011; Available at: http://www.ehss.vt.edu/. [Retrieved November 20, 2018].
9. Eyayo F. Evaluation of occupational health hazards among oil industry workers: A case study of refinery workers. IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT). 2014; 8(12): 22-53.
10. Rongo AR. Occupational Exposure and Health Problems in Small Scale Industry. 2011; Available at: https://www.ilo.org/safework [retrieved November 16, 2017].
11. Oluwagbemi BF. Basic Occupational Health and Safety. Ibadan: Vertex Publishing Press. 2007.
12. Sabitu K, Illiyasu Z, Dauda MM. Awareness of Occupational Hazards and Utilization of Safety Measures among Welders in Kaduna Metropolis. American-African medical Journal.2009; 8(1) 46-51.
13. Park K. Textbook of Preventive and Social Medicine. Jabodjur: BanasidaBhanot. Publishers.2011.
14. Canadian Centre for Occupational Health and Safety. Welding Personal Protective Equipment and Clothing. 2015; Available at: http://www.ccohs.ca/oshanswers/safety[Retrieved December 22, 2017].
15. Amulla AO. Industrial injuries and safety enforcement activities in Nigerian factories. Nig Med Pract. 2017; 33(2):14-17.
16. Awosan KJ, Makusidi MA, IbrahimMTO, Suleiman A, Magaji TG,MbatifuhFG. Knowledge and Safety Practices Related to Exposure to Physical and Chemical Hazards among Welders in Sokoto, Nigeria. Asian Journal of Medicine and Health. 2014; 9(1): 1-11.
17. Lipscomb HJ. Effectiveness of interventions to prevent work-related eye injuries. American Journal Preventive Medicine. 2000;7(18): 27-33.
18. OkoyeOI, Umeh RE. Eye Health of Industrial Workers in Southeastern Nigeria. West African Journal of Medicine. 2002;11(21): 132-137.
19. Harris PM. Nonfatal Occupational injuries involving the eyes, US Department of Labor Bureau of Labor Statistics.2002.
20. World Health Organization. World Health Report.2008.

How to cite this article: Obarhoro OI, Nwufo CR, Nworu B et.al. Compliance in the use of personal protective equipment by welders in Delta state, Nigeria. International Journal of Research and Review. 2020; 7(1): 21-26.

******