



SOCIO DEMOGRAPHIC DETERMINANTS OF HEALTH HAZARDS AWARENESS AMONG ROAD SIDE WELDERS IN MAIDUGURI, BORNO STATE, NIGERIA.

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ABSTRACT

Protecting the health of workers cannot be achieved without the workers having adequate knowledge of hazards in their workplace. Knowledge of these hazards can be affected by several factors. Discovering the factors that affect knowledge will help in instituting measures to ensure that the workers have adequate knowledge. This study aimed to assess the socio-demographic determinants of health hazards awareness among welders in Maiduguri Borno State, Nigeria. A questionnaire was used to obtain information from 295 welders chosen through a systematic random sampling technique. The socio-demographic determinants measured include age, educational attainment, length of practice, type of training received and use of Personal Protective Equipment (PPE). The data collected were analyzed using descriptive statistics of frequencies and percentages, and inferential statistics of Chi-square. Data indicated 66.22% of the respondents as having a high awareness of health hazards associated with their work. In addition, the chi-square test revealed that awareness of health hazards was positively influenced by age of the respondents, educational attainment, length of practice (experience) and type of training received. There was no association between awareness of health hazards and the use of PPE in the study area. The study, therefore, recommends the need for the government to have a proper health education session for this economically viable group on the health effects of these workplace hazards as this will contribute to the reduction of work-related injuries, as most of the welders are after the economic benefit derived from the occupation while the health hazard is grossly disregarded.

Keywords: Awareness, Determinants, Health hazard, Maiduguri, Socio demographic, Welders

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Roadside welders are among the most economically viable group of workers especially in developing countries due to the increasing rate of urbanization and industrialization. However, the workers are exposed to a lot of physical, chemical, biological, mechanical and psychosocial risks during welding. Welding is the process of cutting and joining metal parts using a flame or electric arc and other sources of heat to melt and cut or to melt and fuse metals (Iliyasu and Lawan, 2010). It is an important tool for maintenance and construction in industries, but it has serious health-related problems which may potentially cause injury to workers. As in the case in most metal working industries, the potential for bodily harm and hazardous situations exists. High electrical currents and voltages are used to operate machinery and welding equipment. Machinery for shearing, forming, and punching various thicknesses of materials are used. Flammable and other compressed gases are used during flame cutting and welding operations. Welders may work in enclosed, restricted spaces and at times at high elevations and in awkward places. There is an undesirable noise level generated during the welding process (Adu and Danquah, 2016).

Exposure to this health hazards has become an important public health problem globally. According to World Health Organization, (2010) and International Labor Organization, (2010) estimate for the year 2000, about 2 million people die each year as a result of occupational accidents and work-related illnesses or injuries. Another 268 million nonfatal workplace accidents results in an average of three lost days per casualty, as well as 160 million new cases of work-related illness each year (ILO, 2010). Similarly, occupational hazards also account for 2.3% of disability-adjusted life years (DALYs) lost among middle-income countries (ILO, 2010).

Exposure to occupational hazards with the resultant injuries, diseases and death has profound effects on work productivity and the socioeconomic well-being of workers. These hazards are very common in the informal sectors (such as welding) which is inadequately supervised and lacks occupational health services (WHO, 2010). In addition, because of inadequate financing and difficulties in obtaining credit facilities, small-scale industries use obsolete machinery and equipment, thus limiting their productivity and increasing exposure to hazards.

Traumatic eye injury is one of the most significant occupational health and safety concerns for welders, others are, gastrointestinal effects such as nausea, cramps and slow digestion. Long-term health effects include increased risk of lung cancer, cancer of the larynx and urinary tract, chronic respiratory problems (such as bronchitis, asthma, pneumonia, emphysema, pneumoconiosis, and decreased lung capacity), silicosis and siderosis among others (Okuga *et al.*, 2012). The welding work processes are also associated with the risk of other physical injuries such as cuts, burns, and hearing impairment resulting from loud noises. Welders are exposed to fumes containing metals like zinc, copper, cobalt, nickel, chromium, platinum, and their oxides leading to various respiratory dysfunctions and the influenza-like condition called fume fever (Sabitu *et al.*, 2009).

The major economic activities of people in Maiduguri include commerce in primary products mostly agricultural goods, manufactured goods and tertiary services such as banking and transportation. Others are hawking, small trade and craft stands, mechanic workshops, vulcanizers, fuel hawkers, corner shops, kiosks, stalls, gas sales, and several other varieties of goods and services following the mass influx of Internally Displaced Persons (IDPs) arising from the insecurity challenges in many parts of the State (Waziri and Umar, 2014).

Small-scale welding is also one of the most visible features along major streets in Maiduguri and is among the economically viable group of workers with no organized health services. Besides, their knowledge of health hazards and adherence to safety measures is unknown. Welding is a very difficult and dangerous profession so welders

need to follow general safety guidelines. In this way, they can ensure not only their safety but the safety of others around them. Education and training of welders in all aspects of welding and fabrication especially safety in the welding industry are thought to be very important due to the hazards and risks associated with the welding process. Education and training increase the knowledge base of all people employed in the welding industry at every level, enabling them to make decisions that will result in the utilization of the best welding process. Awareness and employment of safety practices are also important ways of preventing or reducing the risk of health hazards associated with the occupation. Protecting the health of workers cannot be achieved without the workers having adequate knowledge of the hazards in their workplace. Knowledge of these hazards can be affected by several factors and discovering these factors that affect knowledge will help in instituting measures to ensure that the workers have adequate knowledge.

Despite this hazardous situation associated with this occupation, most research conducted in Maiduguri on health awareness is geared towards other occupations rather than welding (Dathini *et al.*, 2014; Salamatu and Ibrahim, 2015; Dabawa, 2019). The creation of awareness of this hazardous situation for welders in the welding workshops is geared toward changing the attitude, imparting skill and knowledge and reorienting the mindset of the welders which will result in the utilization of the best welding technology and enhance the adherence of safety practices. It is imperative therefore to assess the socio-demographic determinants of health hazards awareness among roadside welders in Maiduguri Borno State, North-Eastern Nigeria.

THE STUDY AREA

The study area is Maiduguri, the capital of Borno State. Maiduguri is located in the Northeastern part of Nigeria at latitudes 11° 43' N and 11° 52' N and Longitude 13° 05' E and 13° 15' E. (Figure 1). It covers a total area of 543 km², which makes it the largest city in the Northeastern region of Nigeria. It has an altitude of 345 meters above sea level. It is characterized by low precipitation (650 mm), high evaporation and perennial water shortage. The highest rainfall is in August and the greater part is received during the month of July, August and September. Generally, the mean monthly temperature is always above 20°C but the daily extremes vary in a wide range reaching up to 47°C in April (Jimme *et al.*, 2016).

METHODOLOGY

The study was conducted in Maiduguri the Borno State capital from the period of June 2019 to October 2019. The design of the study was cross-sectional. The study area consists of 1,400 small-scale welders who are registered members of the welders association (Records of Welders Association, 2019). Systematic Random sampling technique was used in choosing the respondents of the study, the sample size for 1,400 population is 302 using the Krejcie and Morgan (1979) table of sample size determination for the population proportion of 0.5 and 95% confidence level (Kothari, 2004). The membership register maintained by the welders association formed the sampling frame (1400). A random starting point was obtained using a random number table with a sampling interval of 5. Informed consent was obtained from the welders prior to the commencement of the study. Data for the study were collected through structured questionnaire administration. The questionnaire consists of both open and close-ended questions. Awareness variables were measured on a five points Likert scale with possible responses including strongly agree, agree, strongly disagree, disagree and undecided. Health hazard awareness was summed to create the scale of

measurement on a 95 point scale so that a score of >70% indicates high awareness, 50-70% indicates moderate awareness and <50% indicates low awareness respectively. A pilot study was conducted and the questionnaire was pre-tested and validated among some welders. Some of the questions were rephrased for clarity. Data for the study were analyzed using descriptive statistics of frequency distribution tables and percentages and inferential statistics of the chi-square test. The descriptive statistic was used to describe the socio-demographic characteristics of the respondents. The chi-square test was used to determine the association between awareness of health hazards and socio-demographic variables (age, educational attainment, length of practice, type of training received and use of personal protective equipment). The data were cleaned, validated and analyzed using SPSS version 20.

RESULTS AND DISCUSSIONS

SOCIO DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Two hundred and ninety five (295) of the three hundred and two (302) questionnaires administered were adequately completed and used for the analysis giving a response rate of 97.6 percent. The distribution of respondents by socio demographic characteristics is summarized in Figure 2 below. All the respondents in the study area were males as most of the females perform jobs that are less hazardous. Most of the welders are in their active age as the mean age of the respondents is 30.6 ± 9.3 years with 41% in the 20-29 years age bracket. As shown in Figure 3, the rate of welders who attained the formal education in this study were 75.3% which might be due to high population of unemployed graduate adopting vocational skills to earn a living coupled with high rate of internally displaced persons (IDPs) in the Maiduguri metropolis who are now adopting vocational skills. The study also reveals that 36% of the welders were Hausas. The proportion were slightly higher than the Kanuri (32%), even though they are the dominant ethnic group in Maiduguri. This might be attributed to the increasing population of Almajiris coming from the north-western states of Kano, Jigawa, Zamfara, and Katsina to memorize the Holy Qur'an in Maiduguri who are now adopting different vocational skills. The Yoruba, Igbo and other ethnic groups like Shuwa arab, Marghi, Mandara, and Babur were equally represented as shown in Figure 4 below. The finding as shown in Figure 5 further revealed that 70.17% of the respondents were married. The proportion of married welders in this study were higher than observed in a similar study in Kano by Iliyasu and Lawan, (2010) that reported only 33% of married welders. This might be attributed to socio cultural factors in the study area. Another reason might be the socio economic benefits derived from the welding occupation that help welders earn a living and cater for their families.

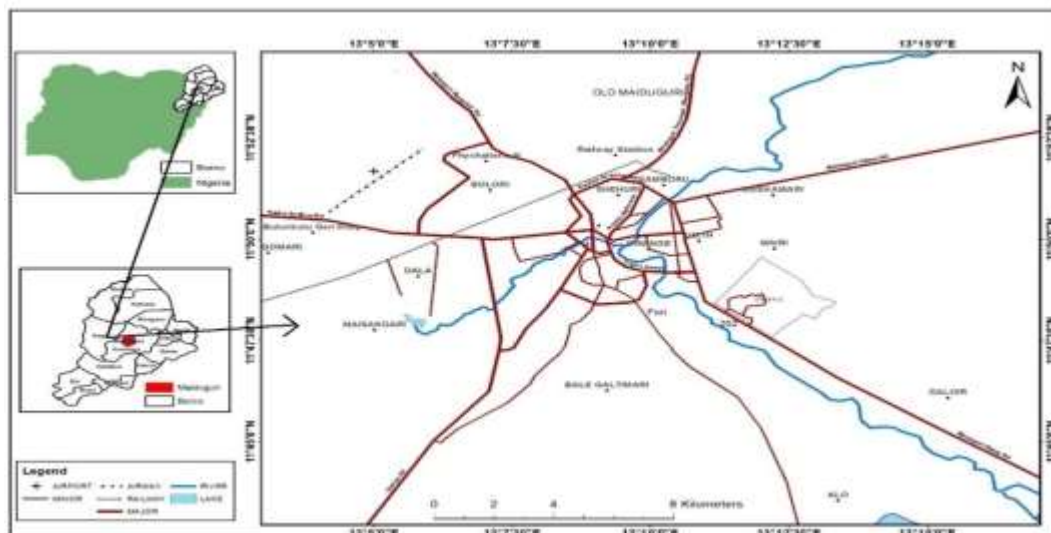


Figure 1: Showing the study area (Maiduguri Metropolis)
(Source: GIS laboratory UNIMAID (2019))

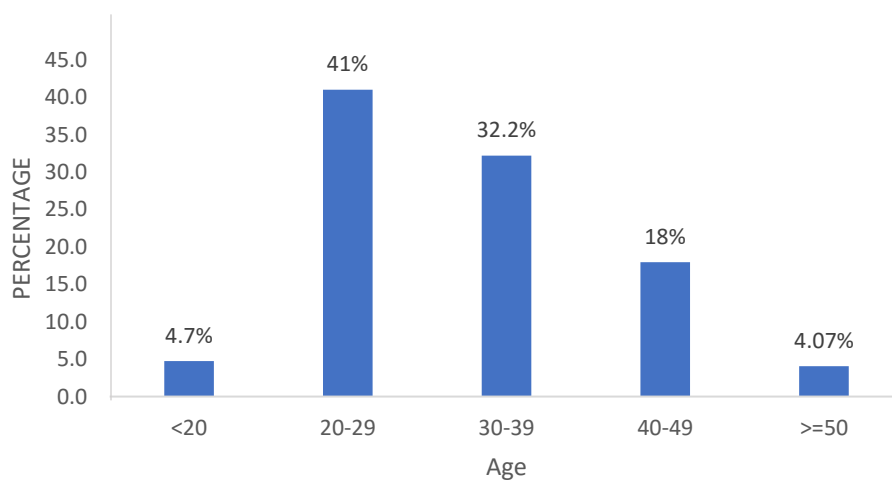


Figure 2: Age distribution of the respondents

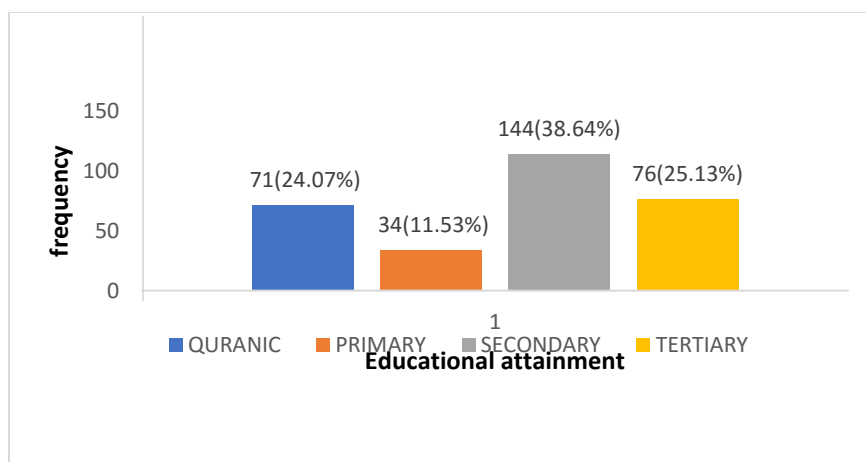


Figure 3: Educational attainment of the respondents

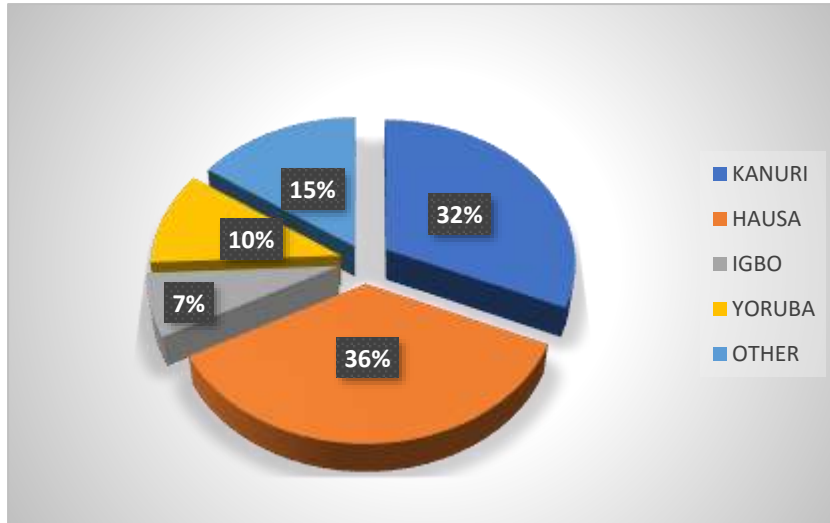


Figure 4: Ethnicity of the respondents

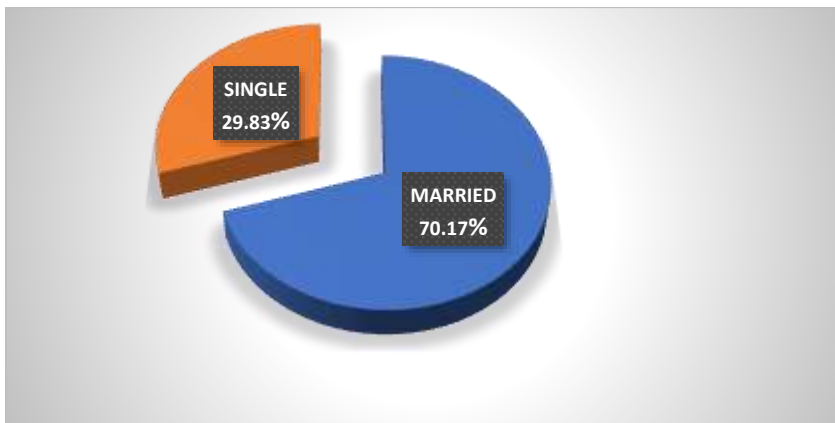


Figure 5: Marital status of the respondents

TYPES OF MATERIALS FABRICATED BY WELDERS

Sixty-one percent (61%) of the respondents as shown in Figure 5 fabricate building materials such as doors, windows and gates. This could be attributed to the rapid expansion of the Maiduguri metropolis as it now extended to some parts of Mafa, Konduga, Bama and Kaga Local Government areas (Jimme *et al.*, 2016). Another factor might be the result of the reconstruction and rehabilitation of the local government areas destroyed by the Boko Haram insurgency in Borno State. Construction of metal chairs also received a response of 7%. The reason could be a result of the relocation of some schools affected by the insurgency from the Northern part of Borno State to the Maiduguri metropolis, coupled with the increasing number of newly constructed mega schools in the state. 11% of the welders fabricate fuel/water tanks and 15% grinding machines. A fraction of the respondents fabricates and sell other materials such as trucks, and wheelbarrows.

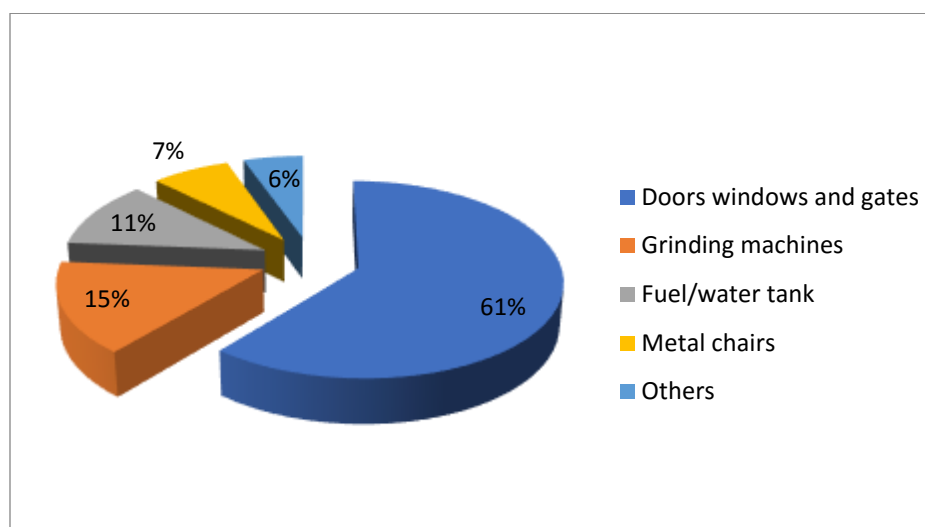


Figure 5: Types of materials fabricated by welders

LEVEL OF AWARENESS OF HEALTH HAZARDS AND SAFETY MEASURES AMONG WELDERS

The level of awareness of health hazards and safety measures among roadside welders in the study area is presented in Figure 6. The study revealed that 66.22% of the respondents are aware that their job is hazardous to their health. The proportion corroborates with a similar study conducted in Ghana, where 67% health hazards awareness among roadside welders was recorded (Adu and Danquah, 2016) but contrary to the study done in the North-Western part of Nigeria that recorded 90.7% of welders with high awareness of health hazards (Awosan *et al.*, 2017). This study further revealed that 21.62% of the respondents have moderate awareness of the health hazards while 12.16% have low awareness. This finding has revealed that a significant percentage (66.22%) of welders in the study area were aware of the health hazards and safety measures associated with welding as a profession.

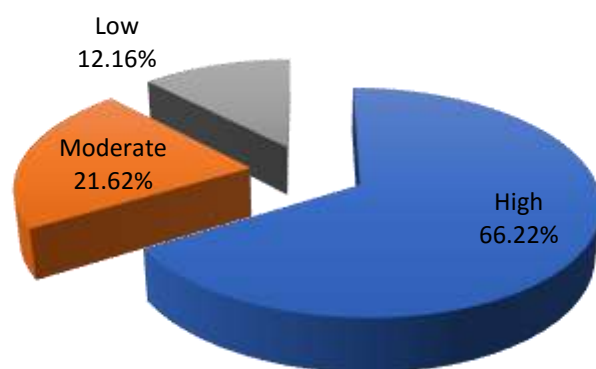


Figure 6: Level of awareness of health hazard and safety measures

ASSOCIATION BETWEEN AWARENESS OF HEALTH HAZARDS AND WORKING HOURS

With respect to the association between awareness of health hazards and working hours in a day, data in Table 1 below indicates that working hours in a day ranged from 5 to 15 hours among welders, with 65.76 % which lasted for 5-10 hours at work daily and 33.90 % working for 11-15 hours. The implication of this finding is presumed that prolonged duration of welding in awkward postures may cause muscular-skeletal discomfort such as backache, fatigue and overstretching of muscles and joints among welders. The chi-square test of goodness of fit revealed no association between awareness of health hazards and working hours ($X^2= 3.806$, $P=0.433$).

ASSOCIATION BETWEEN AWARENESS OF HEALTH HAZARDS AND TYPE OF WELDING

Data in Table 2 showed that 57.97% of the welders used electric arc welding, 22.03% worked with oxyacetylene flame (gas welding) and 20% combined both methods. The reported high use of electric arc welding was also observed in a related study in the North-Western part of Nigeria by Awosan *et al.* (2017) who reported 82.1% of the welders worked with arc welding. Although the proportion is slightly higher than that observed in this study but corresponded with a similar study by Ajayi *et al.* (2011) in the Southern part of the country. The chi-square test reveals no association between awareness of health hazards and the type of welding practiced ($X^2= 8.656$, $P=0.194$). This implies that type of welding is not a determinant of health hazard awareness in the study area.

ASSOCIATION BETWEEN AWARENESS OF HEALTH HAZARDS AND NUMBER OF TIMES INJURED IN A YEAR

With respect to the awareness of health hazards and number of times injured in a year by welders in the study area, data in Table 3 indicated that slightly half (48.47%) of the welders have experienced injury less than 5 times in a year, 27.12% of the welders were injured between 5-9 times in a year, 4.75% were injured between 10-15 times in a year while 19.66% were injured more than 15 times in a year. This might be probably due to welders employing unconventional and non-standard Personal Protective Equipment (PPE) whose protection level is less or minimum and or inconsistent use of PPEs as observed in this study. The chi-square test revealed no association between awareness of health hazards and number of time injured in a year ($X^2= 7.307$, $P=0.504$). This implies that number of injury encountered is not a determinant of health hazard awareness in the study area.

SOCIO DEMOGRAPHIC DETERMINANTS OF HEALTH HAZARDS AWARENESS

With respect to the chi-square results for the socio demographic factors associated with level of awareness of health hazards among road side welders, the socio demographic variables studied included Age of the respondents, educational attainment, length of practice (experience), use of personal protective equipment and type of training received as shown in Table 4.

The chi-square test of goodness of fit revealed that there is an association between awareness of health hazards and age of welders ($X^2= 18.67$, $P=0.017$). Specifically, age of welders determines their level of awareness of health hazards associated with their work. This implies that older welders in Maiduguri are more likely aware of health hazards than their younger colleagues.

The chi-square test also revealed that there is an association between awareness of health hazards and educational attainment of road side welders ($X^2= 15.033$, $P=0.020$). This means that a higher number of educated welders are

aware of health hazards associated with their work as compared to their uneducated colleagues. This finding presumes that educational attainment may facilitates easy assimilation of instruction and it is in agreement with previous studies conducted in other countries which revealed the association between awareness of health hazards and educational attainment (Adu and Danquah, 2016). However, studies in North-western part of Nigeria are contrary to this study that reported education is not a determinant of awareness of health hazard. (Awosan *et al.*, 2017)

Similarly, as shown in Table 4, the Chi-square test revealed that there is an association between awareness of health hazards and length of practice ($X^2= 15.792$, $P=0.045$). This showed that experienced road side welders who have been in the occupation for a long period of time were aware of the health hazards associated with their work compared to their inexperienced counterpart who have not being in practice for a long period of time.

Paradoxically, the chi-square results also showed an association between awareness of health hazards and type of training received. This means that a higher proportion of welders trained through apprenticeship were aware of health hazards compared to those that attended formal welding schools($X^2= 16.785$, $P=0.000$). This could be due to the skill based nature of apprenticeship and their longer duration of training as the apprenticeship program graduate their students based on skills acquisition rather than a fixed period of training. This study has also revealed that the use of PPE is an insignificant factor of awareness of health hazards. ($X^2= 5.085$, $P=0.279$) which implies that the use of PPE does not determine the level of health hazards awareness of welders.

Table 1: Chi square test of association between awareness of health hazards and working hours

Variables	Frequency n= 295	Percentage (%)	X^2	P-value
Hours' work per day				
5-10hrs	194	65.76	3.806	0.433
11-15hrs	100	33.90		
16-20hrs	1	0.34		
Total	295	100		

Table 2: Chi square test of association between awareness of health hazards and type of welding practiced

Variables	Frequency n= 295	Percentage (%)	X^2	P-value
Type of welding practice				
Electric welding	171	57.97	8.656	0.194
Gas welding	65	22.03		
Both electric and gas welding	59	20.00		
Total	295	100		

Table 3: Chi square test of association between awareness of health hazards and number of times injured in a year

Variable	Frequency n = 295	Percentage (%)	X^2	P- value
Number of times injured in a year				
<5 times	143	48.47	7.307	0.504
5-9 times	80	27.12		
10-15 times	14	4.75		
>15 times	58	19.66		
	295	100		

Table 4: Result of chi-square test on socio demographic determinants of awareness of health hazards

Variables	High	Moderate	Low	X ²	P- value
Age					
<20	8	4	2	18.67	0.017
20-29	93	19	9		
30-39	57	25	13		
40-49	33	13	7		
≥50	5	2	5		
Education					
Qur'anic	43	22	6	15.033	0.020
Primary	18	9	7		
Secondary	86	13	15		
Tertiary	49	19	8		
Length of practice					
<5 years	65	13	2	15.792	0.045
5-9 years	60	22	17		
10-15 years	35	17	9		
16-20 years	17	7	4		
≥21years	19	4	4		
Type of training received					
Apprenticeship	172	60	24	16.795	0.000
Vocational training school	24	24	12		
Use of PPE					
Always	100	40	19	5.085	0.279
Sometimes	50	13	12		
Never	46	10	5		

CONCLUSION AND RECOMMENDATIONS

In conclusion, it revealed from this study that there is overwhelming evidence that roadside welders in Maiduguri are aware of the health effect of welding which is positively influenced by age, educational attainment, length of practice and type of training received. The use of PPE and the type of welding practice do not influence awareness of health hazards among welders in the study community. This study, therefore, recommends health education sessions for this group of workers as this will contribute to a reduction of work-related injuries, as most of the welders are after the economic benefits derived from the occupation while the health hazards are grossly disregarded.

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CONFLICT OF INTERESTS

The Authors declare that they have no competing interest

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