ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

Occupational Safety: PPE Use and Hazard Experiences among Welders in Valencia City, Bukidnon

Julsar T. Calonia[1]; Dickson P. Pagente[2]
Research Center
San Agustin Institute of Technology,
Valencia City, Philippines

Kim Glazele P. Verano[3]; Annelyn D. Alacapa[4];
Jeneivie D. Marata[5]
College of Education
San Agustin Institute of Technology,
Valencia City, Philippines

Abstract:- This study aimed to determine the significant difference on occupational hazards and the use of personal protective equipment when respondents are grouped according to their length of service and type of training undertaken among welders in Valencia City, Bukidnon. The study employed a quantitative approach utilizing a descriptive-comparative research design. Using non-probability sampling, 46 formally trained welders and another 51 informally trained welders in Valencia City, Bukidnon, were chosen as the respondents for this study. In the demographic profile, the findings showed that the majority, or 54%, of the respondents had 0 to 5 years of experience in terms of their length of service. Based on the statistical data, it was revealed that the level of experience in occupational hazards for both formally trained and informally trained welders was low. Additionally, the level of use of personal protective equipment (PPE) for formally trained welders was high, while for informally trained welders, it was moderate. When the test of difference was executed, the finding showed that the experience of occupational hazards does not differ when grouped according to the types of training undertaken. This denotes that formally and informally trained welders equally experience welding-related occupational hazards. Moreover, another finding showed that the use of personal protective equipment (PPE) differed according to the type of training undertaken. This finding suggests that formally trained welders are more likely to adhere to prescribed safety protocols and utilize recommended PPE, indicating a stronger awareness of occupational hazards and a deeper understanding of the importance of protective measures. Furthermore, the finding revealed that welders' experience of occupational hazards differs by length of service. This denotes that veteran welders encounter a higher level of occupational hazards compared to their less-experienced counterparts. Subsequently, the last finding revealed that there is no significant difference in the use of personal protective equipment (PPE) among the welders when grouped according to length of service. The researchers recommend that the emphasis on PPE compliance might be ingrained uniformly across all levels of experience, reflecting a robust culture of safety consciousness and an understanding of the indispensable role of protective gear in mitigating occupational risks.

Keywords:- Personal Protective Equipment; Occupational Hazard; Welding; Comparative.

I. INTRODUCTION

The lack of awareness regarding occupational hazards and safety precautions in the welding profession is a growing concern, not only in the Philippines but also on a global scale. According to a previous World Health Organization (WHO) survey, an alarming 250 million workplace injuries occur worldwide yearly. Welding, especially in developing countries, notably contributes to these occupational accidents (Beji et al., 2022). This assertion gains further credibility from a recent joint study conducted by the WHO and the International Labour Organization (ILO) in 2021. This study identified the leading occupational risk factors responsible for the highest number of deaths and disability-adjusted life years (DALYs) globally, including occupational particulate matter, gases, fumes, noise, and injuries (WHO & ILO, 2021). Notably, these risks are often associated with welding occupations. Welding is inherently hazardous, with multiple factors that can compromise the well-being of welders. These factors encompass exposure to intense heat, burn risks, radiation (including ultraviolet, visible, and infrared), noise pollution, toxic fumes, hazardous gases, the potential for electrocution, uncomfortable working postures, and significant variations in the chemical composition of welding fumes (Budhathoki et al., 2014).

Outrageously, statistics from the Bureau of Labor Statistics (BLS) indicate that welding accidents account for a staggering 25% of all fatal occupational accidents. Moreover, these statistics reveal that over 560,000 workers suffer injuries from welding accidents yearly (Bureau of Labor Statistics, 2022). In light of these findings, it is imperative to prioritize safety measures, raise awareness, and provide adequate training to protect welders and mitigate the risks associated with this critical profession (Li et al., 2022).

The reliance on welding jobs is increasing in the Philippines due to progressive industrialization. Moreover, the Philippines' welding industry depends on human power, unlike in other countries, where they rely on advanced technology and robotics (Ramos et al., 2020). Therefore, several Filipino welders were exposed to the risk of

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

occupational hazards. Although the government has strengthened the mandate on occupational safety and health standards (Civil Service Commission, 2020; Tanggol, 2018), recent news published by The Philippine Star mentions that despite the implementation of the Occupational Safety and Health (OSH) law, the country is still far from developing a culture of a safe and healthy workplace (Mayen, 2019). The issues mirroring the challenges welders face in Valencia City, Bukidnon, stem from their exposure to hazards and inadequate safety measures, leading to severe injuries. Based on the abovementioned issues, the researchers believe this study is urgently needed. Furthermore, as no prior studies have been conducted in Valencia, Bukidnon, concerning occupational hazards and personal protective equipment, the researchers aim to fill this research gap by conducting one.

Occupational hazards are risks, dangers, or potential harm that individuals encounter in their workplaces due to the nature of their job duties or the environment in which they work. These hazards can lead to injuries, illnesses, or adverse health effects, and they are a significant concern across various industries and professions. Occupational hazards can take many forms, including physical, chemical, biological, ergonomic, and psychosocial hazards (Li et al., 2022; World Health Organization [WHO] & International Labour Organization [ILO], 2021).

Physical hazards involve dangers like machinery accidents, falls, or exposure to extreme temperatures (Asiry & Ang, 2019). Chemical hazards arise from exposure to harmful substances or toxic chemicals, which can lead to chemical burns, respiratory issues, or long-term health problems. Biological hazards are associated with exposure to pathogens, such as viruses and bacteria, which can result in infectious diseases (Tsydenova & Bengtsson, 2011). Ergonomic hazards are related to the physical strain and stress that may occur from repetitive tasks, heavy lifting, or awkward postures, leading to musculoskeletal disorders (Vaisbuch et al., 2019). Finally, psychosocial hazards encompass workplace stress, harassment, and mental health issues, which can result in anxiety, depression, or other psychological disorders (Oakman et al., 2022).

Another critical occupational hazard in welding is the inhalation of welding fumes and gases (Chauhan et al., 2014). These fumes can contain toxic substances, such as metal oxides and gases like ozone and nitrogen dioxide, leading to respiratory problems, including welding-related lung diseases and chronic conditions (Nalugya et al., 2022). Further, electric shock is another danger welders must be cautious of, as welding equipment uses high electrical currents. Inadequate grounding or damaged equipment can result in serious injuries or fatalities (Manuti et al., 2015). Repetitive motions and awkward positions in welding can contribute to ergonomic hazards, leading to musculoskeletal disorders over time. Additionally, noise generated by welding machines can cause hearing loss if proper hearing protection is not used (Prabhu et al., 2017; Alexander et al., 2016).

To mitigate these occupational hazards, welders should receive comprehensive training, use appropriate personal protective equipment (PPE), maintain well-ventilated workspaces, and diligently follow safety guidelines and procedures. Employers also play a crucial role in ensuring a safe working environment, including providing adequate training, PPE, and regular equipment maintenance. Occupational safety measures are essential in safeguarding the health and well-being of welders in various industries (Z'gambo, 2015; Chauchan et al., 2014).

Personal Protective Equipment (PPE) is essential for safeguarding individuals against workplace hazards. PPE comprises gear and clothing designed to shield workers from various risks. Helmets protect the head from falling objects, goggles shield the eyes from debris and chemicals, and respirators filter out harmful particles from the air. Gloves guard against cuts and chemicals, while earplugs help prevent hearing damage due to excessive noise. PPE is critical when engineering controls or work practices alone cannot eliminate risks. Proper training and regular inspection of PPE ensure its effectiveness, enhancing workplace safety and reducing the likelihood of injuries, illnesses, and fatalities (Nalugya et al., 2022; Tagurum et al., 2018; Alexander et al., 2016).

In the context of welding, Personal Protective Equipment (PPE) plays a paramount role in ensuring the safety and well-being of welders. Welding involves numerous hazards, such as intense heat, sparks, UV radiation, and toxic fumes. Welding PPE includes a welding helmet with a face shield to protect the face and eyes from the bright arc and potential debris. Welding gloves shield the hands from burns and cuts, while flame-resistant clothing prevents skin exposure to sparks and molten metal. Respirators and proper ventilation are vital for filtering harmful welding fumes and gases. Welding boots protect the feet from falling objects and hot metal (Tadesse et al., 2016; Eze et al., 2015; Budhathoki et al., 2014).

One of the key consideration for welders experienced occupational hazard and their way of using proper protective equipment may varies with their length of service. The length of service of a welder can be a crucial factor in understanding the level of expertise and potential risks associated with the job. Welders with longer lengths of service may have more experience handling welding equipment, identifying hazards, and implementing safety measures. However, they may also have accumulated a greater lifetime exposure to welding-related occupational hazards, such as exposure to harmful fumes, intense heat, and risks of burns or injuries (Z'gambo, 2015; Budhatoki et al., 2014). Therefore, assessing welders' service length can be valuable in evaluating their experience level and understanding how it might relate to their awareness of and protection against welding-related occupational hazards. It can inform safety training, hazard mitigation, and health monitoring programs in the welding industry (Chauhan et al., 2014).

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

On the other hand, also it differ depending on their type of training undertaken. People undertake various training types, broadly categorized as formally and informally trained experiences. Formally trained individuals engage in structured, institutionally recognized educational programs culminating in degrees, certifications, or qualifications. These programs often include formal coursework, specific learning objectives, and assessments (Eze et al., 2015). Examples of formal training include pursuing a bachelor's degree at a university, enrolling in vocational programs to become certified professionals, or attending medical or law school to acquire specialized skills and credentials (Manuti et al., 2015).

In the context of welding, being formally trained signifies the completion of a structured and comprehensive education program specifically designed to equip individuals with the knowledge, skills, and certifications required to excel in the field of welding. This formal training is typically provided by vocational schools, technical colleges, or specialized welding institutions (Alexander et al., 2016). Formal training in welding encompasses a well-defined curriculum that covers essential aspects of welding techniques, safety protocols, metallurgy, and industry-specific standards. Students undergo rigorous classroom instruction to understand the theory behind welding processes and are extensively trained in practical, hands-on welding exercises (Prabhu et al., 2017).

One of the crucial outcomes of formal training is the attainment of recognized welding certifications. These certifications validate a welder's competence in industry-specific quality and safety standards. Moreover, formal training often provides opportunities for specialization in various welding methods, enabling welders to focus on areas aligned with their career goals. Ultimately, formal training in welding is essential for those seeking to pursue a welding career, as it ensures competence, safety, and compliance with industry regulations (TESDA, 2017).

On the other hand, informally trained individuals acquire knowledge and skills through less structured, often self-directed means. This form of learning is diverse and flexible, from self-study and personal experiences to online resources and hobby-related pursuits. Informal training includes learning new languages independently, developing coding skills through online tutorials and coding challenges, or honing culinary expertise through experimentation and recipe exploration. Informal training is often driven by personal interests and the pursuit of practical skills rather than the attainment of formal qualifications (Labe & Alaghde, 2017).

In welding, informal training refers to acquiring welding skills and knowledge through non-traditional or self-directed means outside formal educational institutions or structured programs. Informally trained welders may have learned their craft through various unconventional avenues. This could include on-the-job training, where individuals learn welding skills through work experience and guidance from more experienced welders (Ondieki et al., 2013). Some might have acquired welding knowledge through online resources, books, or instructional videos, often experimenting and practicing on their equipment. While informal training lacks the structure and certification of formal welding education, it can still be effective in producing skilled welders (Nalugya et al., 2022). However, informal training often relies on personal initiative and motivation to learn and may not provide a comprehensive understanding of welding theory or safety practices compared to formal training. As such, informally trained welders may find their opportunities and career prospects limited in industries that require formal certifications and adherence to strict quality and safety standards (Alexander et al., 2016; Manuti et al., 2015).

In conclusion, both formal and informal training have their merits. Formal training offers recognized credentials and a structured learning environment, while informal training fosters adaptability, creativity, and lifelong learning. Often, individuals blend elements of both approaches to develop a well-rounded skill set and educational background that suits their goals and interests (Nalugya et al., 2022; Manuti et al., 2015; Eze et al., 2015 & Prabhu et al., 2017).

The study by Budhathoki et al. (2014) demonstrated that higher-educated welders displayed better awareness of occupational hazards and were more inclined to use safety measures. Surprisingly, experienced welders were less aware of welding hazards, possibly due to prolonged exposure leading to risk underestimation. Contrarily, they exhibited a higher propensity for using personal protective equipment (PPE). Younger, less experienced welders showcased greater hazard awareness but a lower inclination to use PPE, possibly due to risk-taking tendencies. All welders acquired skills through informal apprenticeships, lacking formal vocational training available in the region, potentially contributing to limited hazard awareness. The absence of formal safety training further hindered their understanding of occupational risks and necessary preventive measures.

Another study by Tadesse et al. (2016) showed that 86.5% of workers were aware of these risks, such as fumes, intense light, noise, and heat. Moreover, the longer job experience, workplace safety regulations, job satisfaction, and higher education levels were identified as key factors influencing hazard awareness. Accordingly, workers with longer experience were more aware, possibly due to their familiarity with the work environment and exposure to safety training. The author also mentioned that effective implementation of safety regulations was linked to improved hazard awareness. Additionally, job satisfaction significantly impacted hazard awareness, with satisfied workers demonstrating higher awareness. Married and single workers were more aware than divorced workers, suggesting that personal life factors might affect attention to safety. Higher education was associated with better hazard awareness, potentially because more educated individuals process information more critically.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

The study of Z'gambo (2015) highlighted the various risks welders face, including intense light, heat, noise, and fumes, as well as hazards stemming from poor housekeeping and unsafe work structures and tools. While most welders demonstrated awareness of these risks and personal protective equipment (PPE), a small percentage remained uninformed. However, none of the welders consistently used all recommended PPE during work. The prevalence of self-reported health issues such as eye and nasal problems, metal fume fever, respiratory symptoms, burns, and cuts on hands and arms was notably high. Education was linked to increased awareness of hazards and PPE and increased PPE usage. Overall, the study concluded that the working conditions for the welders were hazardous and suboptimal. Despite their awareness of occupational risks, the inadequate use of protective measures resulted in a high incidence of health issues. The findings emphasized the pressing need for more effective preventive measures within the welding profession to mitigate injuries and illnesses.

Futhermore, the study of Amani et al. (2017) supports the abovementioned findings. The authors discovered long work experience often leads to chronic injuries among welders. Most welders, having an average of 13 years of experience, experienced various health issues, particularly ocular injuries due to intense light and poor-quality eye protection. About 40% of welders did not seek medical attention for their eye problems due to financial constraints, impacting their overall well-being. Musculoskeletal issues, such as back and joint pain, were prevalent due to prolonged working hours and a lack of awareness about proper load-carrying techniques. The study also highlighted the prevalence of cuts, burns, and respiratory problems, exacerbated by improper tool maintenance, inadequate ventilation, and smoking. Ventilation systems were suggested to mitigate the risks associated with welding fumes. Notably, the importance of education and awareness in promoting safety practices among welders was emphasized, underlining the necessity for improved training and supervision in the industry.

Thus, this study aimed to identify the level of experience of occupational hazard and personal protective equipment among formally and informally trained welders. In addition, the study tried to ascertain the significant difference on the experience of occupational hazards and use of personal protective equipment when respondents are grouped according to training undertaken. And lastly, establish the significant difference on the experience of occupational hazard and use personal protective equipment when respondents are grouped according to length of service.

II. METHODS

A. Research Design

The study employed a quantitative approach using a non-experimental design and a descriptive-comparative technique. This method involves collecting and analyzing numerical data without manipulating variables or random assignment. This approach describes and compares existing phenomena or groups to identify patterns, trends, or relationships between variables. This approach aims to provide a comprehensive description of the research subjects or groups under study and compare them on various dimensions or characteristics (Creswell, 2014).

B. Research Locale and Participants

This study was conducted at Valencia City, situated at the heart of the province of Bukidnon, Philippines, known as the City of Golden harvest. The study surveyed among 46 formally trained and 51 informally trained. The researchers intended to choose them as the study's respondents since the focus of the present study is to group respondents based on their length of service and type of training undertaken, researchers can assess then whether there is a significant difference in the use of personal protective equipment and exposure to occupational hazards. As part of the criterion, the formally trained should finish Tesda/Technical Vocational courses and have certifications.

In contrast, non-graduate or informally trained people are self-taught, have no certifications, and learn welding through their own experience and apprenticeships. Convenience sampling was employed to determine the sample of the study. Convenience sampling involves selecting the most readily available or convenient individuals for the researchers.

C. Research Instrumens

The instrument used in this study was an adapted questionnaire from the study of Z'gambo (2015) entitled Occupational Hazard and Use of Personal Protective Equipment among Small Scale Welders in Lusaka, Zambia. Though adapted, this questionnaire was slightly modified and translated into Cebuano for the respondents who preferred to answer in the vernacular. The first part of the questionnaire consists of a demographic profile regarding age, gender, and educational level. The second part aims to measure the respondents' level of use of personal protective equipment. Meanwhile, the third part intends to measure the respondents' occupational hazards. Experts validated the research questionnaire with a validation rating of 4.25, which means excellent. Likewise, the questionnaire underwent a reliability test with a Cronbach's alpha rating of 0.653, which means the questionnaire was reliable.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

III. RESULT

A. Demographic Profile

Table 1 presents the demographic profile of the respondents. The findings showed that in terms of the types of training undertaken, 46 respondents (or 47.0% of the total respondents) reported being formally trained, and 51 respondents (or 53.0% of the total respondents) reported being informally trained. Regarding the length of service, the findings show that most welders had 0-5 years of service (54 or 55.7%). Moreover, it is followed by 6-10 years of service (18 or 18.6%).

Table 1. Demographic Profile

Variables	n	%
Types of Training Undertaken		
Formally Trained	46	47.0
Informally Trained	51	53.0
Total	**97**	**100**
Length of Service		
0-5 years	54	55.7
6-10 years	18	18.6
11-15 years	10	10.3
16-20 years	6	6.2
21-25 years	0	0.0
26-30 years	5	5.2
31 years and above	4	4.1
Total	**97**	**100**

On the other hand, the fewest number of respondents were welders with 31 years and above of service (4 or 4.1%).

B. Level of Experience of Occupational Hazard

Table 2 presents the level of experience of occupational hazard of formally trained welders with overall mean of 1.99 (SD=0.59), interpreted as "low." The table further shows, "I have experienced burns because of welding" got the highest mean of 3.52 (SD=1.41). While the item, "I experienced going to clinic/hospital because of nasal symptoms" got the lowest mean of 1.29 (SD=0.64).

Table 2. Level of Experience of Occupational Hazard of Formally Trained Welders

Item Statements	Mean	SD	Interpretation
1. I have experienced burns because of welding.	3.52	1.41	High
2. I experienced eye symptoms after welding because of spark and fumes.	2.94	1.36	Moderate
3. I experienced respiratory symptoms after welding.	2.16	1.16	Low
4. I have tried/experienced cutting myself from any equipment in the shop.	2.13	1.28	Low
5. I have tried being absent from work because I suffered health issues.	1.68	1.01	Very Low
6. I have experienced fever symptoms because of metal fumes in welding.	1.65	0.91	Very Low
7. I experienced nasal symptoms after work.	1.55	0.93	Very Low
8. I have worked secretly without letting someone knows that I am suffering from any health issues from being exposed to hazard.	1.52	0.77	Very Low
9. I have experienced difficulty in hearing because of welding.	1.48	1.03	Very Low
10. I experienced going to clinic/hospital because of nasal symptoms.	1.29	0.64	Very Low
Overall Mean	**1.99**	**0.59**	**Low**

Legend:

Scale	Limits	Verbal Description	Verbal Interpretation
5	4.21-5.00	Always	Very High
4	3.41-4.20	Often	High
3	2.61-3.40	Sometimes	Moderate
2	1.81-2.60	Seldom	Low
1	1.00-1.80	Never	Very Low

In the other side, Table 3 presents the level of experience of occupational hazard of informally trained welders with overall mean of 2.22 (SD=0.52) interpreted as "low". The table further shows that the item, "I have experienced burns because of welding" got the highest mean of 4.23 (SD=0.91). While the item, "I experienced difficulty in hearing because of welding" got the lowest mean of 1.51 (SD=0.85).

C. Level of Use of Personal Protectove Equipment

Table 4 presents the level of use of personal protective equipment of formally trained welders with an overall mean of 4.01 (SD=0.76) interpreted as "high". The table further shows that the item "I use my safety googles to protect my eyes and face when welding" got the highest mean of 4.81 (SD=0.54). While the item, "I wear my PPE or only if I can remember" got the lowest mean of 3.00 (SD=1.61).

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

On the contrary, Table 5 presents the level of use of personal protective equipment of informally trained welders with an overall mean of 3.13 (SD=0.69) interpreted as "moderate". The table further shows that the item, "I use safety googles to protect my eyes and face when welding" got the highest mean of 3.97 (SD=1.04). While the item, "I use ear plugs to protect my ears/hearing when welding" got the lowest mean of 1.83 (SD=1.20).

Table 3. Level of Experience of Occupational Hazard of Informally Trained Welders

Item Statements	Mean	SD	Interpretation
1. I have experienced burns because of welding.	4.23	0.91	Very High
2. I experienced eye symptoms after welding because of spark and fumes.	3.29	1.10	Moderate
3. I have tried/experienced cutting myself from any equipment in the shop.	2.31	1.08	Low
4. I experienced respiratory symptoms after welding.	2.03	0.98	Low
5. I have experienced fever symptoms because of metal fumes in welding.	2.03	0.98	Low
6. I have tried being absent from work because I suffered health issues.	1.86	0.94	Low
7. I experienced nasal symptoms after work.	1.83	0.98	Low
8. I experienced going to clinic/hospital because of nasal symptoms.	1.57	0.88	Very Low
9. I have worked secretly without letting someone knows that I am suffering from any health issues from being exposed to hazard	1.51	0.78	Very Low
10. I have experienced difficulty in hearing because of welding.	1.51	0.85	Very Low
Overall Mean	**2.22**	**0.52**	**Low**

Legend:

Scale	Limits	Verbal Description	Verbal Interpretation
5	4.21-5.00	Always	Very High
4	3.41-4.20	Often	High
3	2.61-3.40	Sometimes	Moderate
2	1.81-2.60	Seldom	Low
1	1.00-1.80	Never	Very Low

D. Mean, Standard Deviation, T-test, Analysis of Variance on Experience of Occupational Hazard when Grouped according to of Training Undertatken and Length of Service of Welders

Table 6 presents means, standard deviations, t-test, and analysis of variance on experience of occupational hazard in terms of types of training undertaken and length of service. In the types of training undertaken, the finding shows that there is no significant difference in experience of occupational hazard between formally trained (M=1.99, SD=0.66) and informally trained welders (M=2.22, SD=0.52); t (64) = -1.57, p=0.112.

In terms of the length of service, a one-way ANOVA was executed. The data also reveals that there is significant difference in experience of occupational hazard between at least 4 groups including 0-5 years (M=2.12, SD=0.51), 6-10 years (M=1.93, SD=0.46), 11-15 years (M=1.77, SD=0.76), and 31 years & above (M=3.35, SD=0.21) with (F (5, 60) = 3.435, p=0.009.

Table 4. Level of Use of Personal Protective Equipment of Formally Trained Welders

Item Statements	Mean	SD	Interpretation
1. I use safety goggles/welding to protect my eyes and face when welding.	4.81	0.54	Very High
2. I wear mask when I am working.	4.65	0.84	Very High
3. I wear safety boots every time I am welding.	4.45	1.18	Very High
4. I always wear Personal Protective Equipment in the field.	4.39	1.15	Very High
5. I wear cover-all or work suit to cover my body when welding.	4.32	1.28	Very High
6. I cover my nose and mouth every time I enter the shop when somebody is welding.	3.94	1.59	High
7. I wear anything to protect my hand.	3.58	1.59	High
8. I use earplugs to protect my ears/hearing when welding.	3.55	1.75	High
9. I use my gloves after welding to get the metal and to prevent myself from burning.	3.45	1.79	High
10. I wear my PPE or only if I can remember.	3.00	1.61	Moderate
Overall Mean	**4.01**	**0.76**	**High**

Legend:

Scale	Limits	Verbal Description	Verbal Interpretation
5	4.21-5.00	Always	Very High
4	3.41-4.20	Often	High
3	2.61-3.40	Sometimes	Moderate
2	1.81-2.60	Seldom	Low
1	1.00-1.80	Never	Very Low

E. Mean, Standard Deviation, T-test, and Analysis of Variance the on Use of Personal Protective Equipment when grouped according to of Training Undertatken and Length of Service of welders

Table 7 presents the means, standard deviations, t-test, Analysis of Variance on the use of personal protective equipment in terms of types of training undertaken and length of service.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

Table 5. Level of Use of Personal Protective Equipment of Informally Trained Welders

Item Statements	Mean	SD	Interpretation
1. I use safety googles to protect my eyes and face when welding.	3.97	1.04	High
2. I wear mask when I am working.	3.89	1.08	High
3. I wear anything to protect my hand.	3.57	0.92	High
4. I wear safety boots every time I am welding.	3.40	1.33	Moderate
5. I wear my PPE or only if I can remember.	3.23	0.88	Moderate
6. I always wear Personal Protective Equipment in the field.	3.17	1.12	Moderate
7. I use my gloves after welding to get the metal and to prevent myself from burning.	3.06	1.16	Moderate
8. I wear cover-all or work suit to cover my body when welding.	2.91	1.15	Moderate
9. I cover my nose and mouth every time I enter the shop when somebody is welding.	2.31	1.23	Low
10. I use ear plugs to protect my ears/hearing when welding.	1.83	1.20	Low
Overall Mean	**3.13**	**0.69**	**Moderate**

Legend:

Scale	Limits	Verbal Description	Verbal Interpretation
5	4.21-5.00	Always	Very High
4	3.41-4.20	Often	High
3	2.61-3.40	Sometimes	Moderate
2	1.81-2.60	Seldom	Low
1	1.00-1.80	Never	Very Low

Table 6. Means, Standard Deviations, and T-test, Analysis of Variance on Experience of Occupational Hazard in terms of Length of service and Training Undertaken.

Variables	n	Mean	SD	95%CI
Types of Training Undertaken				
Formally Trained	48	1.99	0.66	-51.6 - 6.2
Informally Trained	49	2.22	0.52	-52.1 - 6.7
Length of Service				
0-5 years	54	2.12	0.51	194.1 - 229.2*
6-10 years	18	1.93	0.46	166.6 - 219.1*
11-15 years	10	1.77	0.54	127.1 - 227.2*
16-20 years	6	2.48	0.76	154.1 - 341.9
21-25 years^				
26-30 years	5	2.30	1.27	-51.1 - 711.2
31 years & above	4	3.35	0.21	250.0 - 77.3*

*Mean difference is significant at p<0.05, assessed using t-test, ANOVA, post-hoc using Tukey HSD
^Category is not included

In the types of training undertaken, the finding shows that there is significant difference on the use of personal protective equipment between formally trained welders (M=4.01, SD=0.76) and informally trained (M=3.13, SD=0.69); t (64) = -4.920, p=0.000.

Moreover, in terms of the length of service, a one-way ANOVA test result reveals that there is no significant difference in experience of occupational hazard between when group according to length of service (F (5, 60) = 0.504, p=0.772.

Table 7. Means, Standard Deviations, and T-test, Analysis of Variance on Use of Personal Protective Equipment in terms of Length of service and Training Undertaken.

Variables	n	Mean	SD	95%CI
Types of Training Undertaken				
Formally Trained	48	4.01	0.76	52.9 – 123.5*
Informally Trained	49	3.13	0.69	52.0 – 123.8*
Length of Service				
0-5 years	54	3.47	0.95	314.7 – 379.2
6-10 years	18	3.54	0.75	310.9 – 397.7
11-15 years	10	3.96	0.29	368.6 – 422.9
16-20 years	6	3.48	1.05	218.0 – 478.1
21-25 years^				
26-30 years	5	3.30	0.43	-511.9 – 711.2
31 years & above	4	3.95	0.35	334.0 – 375.4

*Mean difference is significant at p<0.05, assessed using t-test, ANOVA, post-hoc using Tukey HSD
^Category is not included

IV. DISCUSSION AND PRACTICAL IMPLICATION

A. Demographic Profile

The demographic profile of the study includes the length of service and types of training undertaken. In terms of length of service, the finding showed that the majority of the respondents were under 0-5 years in ser vice. The result suggests that the welding industry might be experiencing a higher demand for new welders due to factors such as infrastructure projects and construction booms in Valencia City, Bukidnon. This increased demand could lead to more entry-level positions and subsequently attract individuals with less experience.

On the other hand, the number of formally trained and informally trained welders is almost the same since this is part of the inclusion of the research.

B. Experience in Occupational Hazard

The results showed that the level of experience in occupational hazards of both formally trained and informally trained welders was low. The finding suggests that these welders do not frequently encounter health issues in relation to their welding activities. This means that they seldom experienced respiratory problem symptoms, self-inflicted cuts, nasal problem symptoms, difficulty in hearing, fever due to metal fumes, and even visits to clinics or hospitals due to health issues brought by welding-related problems. However, they frequently experience eye problem symptoms and, most of the time, experience burns after welding. The present study's finding corroborated the proposition of Budhathoki et al. (2014) that stressed that welding and cutting carry some dangers. As an illustration, hazardous materials include sputtering, radiation (infrared, blue, and ultraviolet light, slag,

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

heat, heated metal, fumes, vapors, and even electric shock (Tadesse et al., 2016). It is essential to always wear the appropriate PPE because these dangers might result in burns, damage, or even death (Z'gambo, 2015). In order to lessen the experience of occupational hazards, workers must be aware of the illness if the wearing of PPE is being disregarded (Amani et al., 2017).

C. Use of Personal Protective Equipment

In the level of use of personal protective equipment, the findings suggest that the adherence to Personal Protective Equipment (PPE) usage among formally trained welders is notably high, implying a strong awareness and commitment to safety protocols. The result further means that these formally trained welders are knowledgeable about comprehensive approaches to safety, such as wearing safety goggles, masks, boots, coveralls, and gloves and utilizing earplugs. The result emphasizes that formally trained welders consistently used PPE and demonstrated a conscientious effort to prioritize personal safety. Overall, the results indicate these welders have a commendable dedication to protective measures while highlighting the importance of reinforcing consistent PPE compliance through continuous training and awareness campaigns.

The finding above is substantiated by the proposition of several authors (Z'gambo, 2015; Eze et al., 2015) who mentioned that a high level of personal protective equipment (PPE) usage in welding operations reflects a prioritization of worker safety and health in the face of potential hazards. This adherence suggests a strong commitment to minimizing the risks associated with welding, including exposure to harmful fumes, intense light, and high temperatures. It signifies a proactive approach to mitigating potential injuries such as burns, eye damage, and respiratory issues that may arise from welding processes (Prabhu et al., 2017). Furthermore, a high compliance rate with PPE usage underscores an understanding of the critical role of protective gear in safeguarding against the long-term health implications of prolonged exposure to welding-related risks. This emphasis on PPE utilization fosters a culture of safety consciousness within the welding industry. It underscores a commitment to adhering to regulatory standards and best practices, ensuring the well-being and security of welding professionals and those within their vicinity (Tagurum et al., 2018).

To compare, the informally trained showed moderate in terms of using personal protective equipment. A moderate level of Personal Protective Equipment (PPE) usage among informally trained individuals in welding suggests a nuanced understanding of safety practices, possibly stemming from limited awareness and resource constraints. This scenario highlights a potential gap in knowledge and training, underscoring the need for targeted education on the importance of PPE in welding environments (Labe & Alaghde, 2017).

According to these notable authors (Nalugya et al., 2022), moderate adherence to PPE usage among informally trained welders could indicate a lack of access to proper safety resources, limited understanding of the risks involved in welding, or a prevailing misconception about the necessity of protective gear. Consequently, there might be an increased vulnerability to occupational hazards, including burns, eye injuries, and respiratory problems, which could lead to long-term health implications (Eze et al., 2015). Addressing this situation requires comprehensive outreach programs, tailored training initiatives, and improved access to affordable and suitable PPE, aiming to enhance safety awareness and promote a culture of proactive protection within the informally trained welding community (Chauhan et al., 2014).

D. Significant Difference on the Experience of Occupational Hazard and Use of Personal Protective Equipment when Respondents are Grouped according to Types of Training Undertaken and Length of Serives

The T-Test Analysis revealed that experience of occupational hazards differs according to the types of training undertaken. ***Therefore, the first null hypothesis, which states, "There is no significant difference on the experience of the occupational hazard of the welders when grouped according to the type of training undertaken," is accepted***. The lack of significant difference between formally trained and informally trained individuals in terms of their experience with occupational hazards may be attributed to several underlying factors. Occupational hazards in welding often transcend the boundaries of formal training, as they are inherent to the nature of the profession itself, affecting both groups similarly (Z'gambo, 2015).

Additionally, informal training may encompass practical knowledge acquired through hands-on experience, enabling informally trained welders to develop a keen sense of hazard awareness and adopt self-protective measures akin to those emphasized in formal training (Ramos et al., 2020). Moreover, variations in work environments, safety practices adopted by employers, and the use of personal protective equipment (PPE) could contribute to a convergence in the reported experiences of occupational hazards (Budhathoki et al., 2014). Lastly, informally trained welders' adaptability and improvisational skills might compensate for any perceived disparity in formal safety training, ultimately leading to a similar level of experience with occupational hazards among both groups (Z'gambo, 2015).

On the other hand, the findings showed that the use of personal protective equipment (PPE) differed according to the type of training undertaken. ***Thus, the second null hypothesis that states "There is no significant difference on the use of personal protective equipment (PPE) of the welders when grouped according to the type of training undertaken" is rejected.*** This finding suggests that formally trained welders are more likely to adhere to prescribed safety protocols and utilize recommended PPE, indicating a stronger awareness of occupational hazards and a deeper understanding of the importance of protective measures. In contrast, informally trained welders may exhibit lower PPE compliance due to a potential lack of exposure to standardized safety guidelines or limited awareness of the long-term health implications of occupational hazards.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

Several reasons may contribute to this result. Formal training programs often emphasize comprehensive education on occupational safety protocols, including the critical role of PPE, instilling a deep understanding of the necessity and effectiveness of protective gear. In contrast, informally trained individuals may lack exposure to standardized safety guidelines, leading to potentially lower awareness of the importance of PPE (Z'gambo, 2015). Additionally, the presence of stringent regulatory requirements in formal training settings may enforce strict adherence to safety measures, influencing the consistent use of PPE among formally trained welders. Conversely, the absence of such regulatory oversight in informal training environments might result in a more lenient approach to safety practices, leading to a significant disparity in the adoption and utilization of PPE between the two groups (Nalugya et al., 2022). Lastly, the differences in access to resources and education about the potential long-term health implications of inadequate protection could also contribute to this observed distinction (Eze et al., 2015).

Another finding based on the analysis of variance (ANOVA) showed that welders' experience of occupational hazards differs in terms of length of service. ***Hence, the third null hypothesis that states, "There is no significant difference on the experience of occupational hazard of the welders when grouped according to length of service" is rejected.*** The finding highlights the impact of length of service on hazard exposure. Veteran welders encounter a higher level of occupational hazards compared to their less-experienced counterparts. This discrepancy can be attributed to several factors. Over time, veteran welders may have been exposed to a wider range of hazardous materials and environments, leading to a cumulative effect on their health. Moreover, prolonged exposure can result in a decreased sensitivity to potential risks, leading to a tendency to overlook safety protocols. In contrast, new welders, being relatively inexperienced, are more likely to adhere strictly to safety guidelines and may benefit from improved safety practices and technological advancements. The discrepancy in hazard experience underscores the need for continuous education and training on updated safety measures, regardless of the welders' experience level.

The extensive length of service exposes veteran welders to diverse work environments, techniques, and materials, potentially leading to a higher likelihood of encountering complex and diverse occupational hazards (Alexander et al., 2016). Moreover, prolonged exposure to welding tasks without adequate periodic training or updates on safety protocols may result in complacency or an underestimation of evolving workplace risks (Tadesse et al., 2016). Additionally, the physical toll of years of intense welding work could lead to a potential decline in sensory perception, agility, or reaction time, rendering veteran welders relatively more susceptible to workplace accidents (Tagurum et al., 2018). Furthermore, advancements in safety standards and technologies over time might not have been fully integrated into the practices of veteran welders, contributing to the observed disparity in occupational hazard experiences between seasoned and new welders (Labe & Alaghde, 2017).

Furthermore, the finding likewise revealed that welders' level of use of personal protective equipment (PPE) does not differ from length of service. ***Thus, the fourth null hypothesis that states, "There is no significant difference on the use of personal protective equipment (PPE) of the welders when grouped according to length of service" is accepted***. The result implies that adherence to PPE protocols may not necessarily correlate with the duration of a welder's experience in the field. This outcome underscores the notion that the consistent use of PPE remains a crucial standard practice regardless of an individual's tenure in the profession. It suggests that the emphasis on PPE compliance might be ingrained uniformly across all levels of experience, reflecting a robust culture of safety consciousness and an understanding of the indispensable role of protective gear in mitigating occupational risks. Furthermore, it highlights the effectiveness of standardized safety training programs and regulatory measures in fostering a comprehensive understanding of the importance of PPE, promoting a collective commitment to prioritizing the well-being and security of all welders, irrespective of their years of service.

V. CONCLUSION AND RECOMENDATION

The following conclusions are drawn from the results of this study. In the demographic profile, the finding showed that the majority of the respondents were under 0-5 years in terms of length of service. In the types of training undertaken, the formally trained were 31 (47%), and informally trained were 35(53%).

Furthermore, the finding also revealed that both formally and informally trained welders have a low level of experience on occupational hazards related to welding jobs. This means that they seldom experienced respiratory problems, self-inflicted cuts, nasal problems, difficulty hearing, fever due to metal fumes, and even visits to clinics or hospitals due to health issues brought by welding-related problems. In terms of the level of use of PPE, the data showed that formally trained welders had strong awareness and commitment to safety protocols. Consequently, the informally trained welders had moderate levels of PPE use.

In the test of difference, the finding revealed that there is no significant difference in the experience of occupational hazards when grouped according to the types of training undertaken. This denotes that formally and informally trained welders equally experience welding-related occupational hazards. Likewise, the results showed a significant difference on the use of personal protective equipment (PPE) of the welders when grouped according to length of service. This suggests that formally trained welders are more likely to adhere to prescribed safety protocols and utilize recommended PPE compared with informally trained welders.

When the ANOVA test was done, the result revealed that there was a significant difference on the experience of occupational hazards of the welders when grouped according to length of service. This denotes that veteran welders encounter a higher level of occupational hazards compared to

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

their less-experienced counterparts. Subsequently, the result revealed no significant difference in the use of personal protective equipment (PPE) of the welders when grouped according to length of service. The finding suggests that the emphasis on PPE compliance might be ingrained uniformly across all levels of experience, reflecting a robust culture of safety consciousness and an understanding of the indispensable role of protective gear in mitigating occupational risks

As for recommendation, the researcher recommends for the following:

- *For Welders:*

Regardless of experience, continuous adherence to safety protocols, including the use of PPE, is crucial to minimize occupational hazards. Regular refresher courses on safety practices should be encouraged. It is also recommended that those welders who were under informal training, may join short course trainings from TESDA particularly availing scholarship programs to enhance their skills not only on the welding related skills but to inform more about good practices in the use of PPE since most of them use it a occasionally.

- *For Shop Owners*

Implement regular safety training programs for all employees, emphasizing the significance of PPE usage and fostering a culture of safety consciousness within the workplace.

- *For Students and Schools*

Include comprehensive safety modules in welding training programs, integrating practical experiences and emphasizing the importance of PPE adherence from the outset.

- *For Future Researchers*

Conduct in-depth studies to explore the psychological factors influencing the relationship between experience levels and safety practices among welders, aiming to develop targeted interventions for improving occupational safety in the welding industry.

ACKNOWLEDGMENT

The researchers would like to acknowledge the following individuals who made this study successful: The Dean of the College of Education, the Education Program Head, and the Research Director for their continuous support, inspiration, and encouragement. Additionally, the researchers thank the respondents who actively participated in the survey.

REFERENCES

[1]. Beji, A. A., Muhammad, P. H., Yassar, A. A., & Suleiman, H. G. (2022). Hazard evaluation of welding and fabrication workshops in Minna Metropolis, Nigeria. *Iconic Research and Engineering Journals*, *6*(3), 29-33. https://www.irejournals.com/formatedpaper/1703799.pdf

[2]. World Health Organization (WHO) & International Labour Organization (ILO) (2021). WHO/ILO joint estimates of the work-related burden of disease and injury, 2000-2016: Global monitoring report. https://www.who.int/publications/i/item/9789240034945

[3]. Budhathoki, S. S., Singh, S. B., Sagtani, R. A., Niraula, S. R., & Pokharel, P. K. (2014). Awareness of occupational hazards and use of safety measures among welders: A cross-sectional study from Eastern Nepal. BMJ open, 4(6), e004646. https://bmjopen.bmj.com/content/4/6/e004646.short

[4]. Li, G., Jiang, J., Liao, Y., Wan, S., Yao, Y., Luo, Y., ... & Tan, X. (2022). Risk for lung-related diseases associated with welding fumes in an occupational population: Evidence from a Cox model. Frontiers in Public Health, 10, 990547. https://doi.org/10.3389/fpubh.2022.990547

[5]. Ramos, B. A., Baptista, G. O., & Fulong, L. V. (2020). Occupational safety and health standard practices of welding industries of a city in Northern Philippines. Salettinian Open Academic Review, 2(1), 1-1. https://ejournals.ph/article.php?id=16430

[6]. Civil Service Commission of the Philippines (2020). Occupational safety and health standards of the public sector. A CSC-DOH-DOLE Joint Memorandum Circular no. 1 s. 2020. https://www.csc.gov.ph/csc-to-govt-offices-follow-occupational-health-standards

[7]. Tanggol F (2018). The occupational safety and health standards act will protect the health of workers in the Philippines. World Health Organization Malaysia. https://www.who.int/philippines/news/detail/23-08-2018-the-occupational-safety-and-health-standards-act-will-protect-the-health-of-workers-in-the-philippines

[8]. Mayen, J. (2019, July 4). Philippines still far from developing culture of workplace safety. The Philippine Star. https://www.philstar.com/headlines/2019/07/04/1931881/philippines-still-far-developing-culture-workplace-safety

[9]. Li, G., Jiang, J., Liao, Y., Wan, S., Yao, Y., Luo, Y., ... & Tan, X. (2022). Risk for lung-related diseases associated with welding fumes in an occupational population: Evidence from a Cox model. Frontiers in Public Health, 10, 990547. https://doi.org/10.3389/fpubh.2022.990547

[10]. Asiry, S., & Ang, L. C. (2019). Laboratory safety: Chemical and physical hazards. Biobanking: Methods and Protocols, 243-252. https://doi.org/10. 1007/978-1-4939-8935-5_21

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2471

[11]. Tadesse, S., Bezabih, K., Destaw, B., & Assefa, Y. (2016). Awareness of occupational hazards and associated factors among welders in Lideta Sub-City, Addis Ababa, Ethiopia. Journal of Occupational Medicine and Toxicology, 11(1), 1-6. https://doi.org/10.1186/s12995-016-0105-x

[12]. Vaisbuch, Y., Aaron, K. A., Moore, J. M., Vaughan, J., Ma, Y., Gupta, R., & Jackler, R. K. (2019). Ergonomic hazards in otolaryngology. The Laryngoscope, 129(2), 370-376. https://doi.org/10.1002/lary.27496

[13]. Oakman, J., Weale, V., Kinsman, N., Nguyen, H., & Stuckey, R. (2022). Workplace physical and psychosocial hazards: A systematic review of evidence informed hazard identification tools. Applied Ergonomics, 100, 103614. https://doi.org/10.1016/j.apergo.2021.103614

[14]. Chauhan, A., Anand, T., Kishore, J., Danielsen, T. E., & Ingle, G. K. (2014). Occupational hazard exposure and general health profile of welders in rural Delhi. Indian Journal of Occupational and Environmental Medicine, 18(1), 21. https://doi.org/10.4103%2F0019-5278.134953

[15]. Nalugya, A., Kiguli, J., Wafula, S. T., Nuwematsiko, R., Mugambe, R. K., Oputan, P., Tigaiza, A., Isunju, J. B., & Ssekamatte, T. (2022). Knowledge, attitude and practices related to the use of personal protective equipment among welders in small-scale metal workshops in Nansana Municipality, Wakiso District, Uganda. Health Psychology and Behavioral Medicine, 10(1), 731-747. https://doi.org/10.1080/21642850.2022.2106987

[16]. Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L., & Morciano, D. (2015). Formal and informal learning in the workplace: A research review. International Journal of Training and Development, 19(1), 1-17. http://dx.doi.org/10.1111/ijtd.12044

[17]. Prabhu, M., Rokhade, R., Chandra, K. P., & Kakhandaki, A. (2017). A study of awareness and use of personal protective eyewear among welders in a tier 2 city in South India. Indian Journal of Clinical and Experimental Ophthalmology, 3(3), 356-360. https://bmjopen.bmj.com/content/4/6/e004646.short

[18]. Alexander, V., Sindhu, K. N. C., Zechariah, P., Resu, A. V., Nair, S. R., Kattula, D., Mohan, V. R. & Alex T, R. G. (2016). Occupational safety measures and morbidity among welders in Vellore, Southern India. International Journal of Occupational and Environmental Health, 22(4), 300-306. https://doi.org/10.1080/10773525.2016.1228287

[19]. Z'gambo, J. (2015). Occupational hazard and use of personal protective equipment among small scale welders in Lusaka, Zambia (Master's Thesis, University of Bergen, Norway). https://core.ac.uk/download/pdf/30899528.pdf

[20]. Tagurum, Y. O., Gwomson, M. D., Yakubu, P. M., Igbita, J. A., Chingle, M. P., & Chirdan, O. O. (2018). Awareness of occupational hazards and utilization of PPE amongst welders in Jos metropolis, Nigeria. Int J Res Med Sci, 6(7), 2227-33. http://dx.doi.org/10.18203/2320-6012.ijrms20182808

[21]. Eze, B. I., Okoye, O., & Aguwa, E. N. (2015). Awareness and utilization of welders' personal protective eye devices and associated factors: Findings and lessons from a Nigerian population. Workplace Health & Safety, 63(4), 170-178. https://doi.org/10.1177/2165079915578665

[22]. Labe, B. I. & Alaghde, T. (2017) Preparedness of welders with formal and informal training to handle structural construction jobs in Nigeria. CARD International Journal of Engineering and Emerging Scientific Discovery, 2(3),128-150. https://casirmediapublishing.com/2019/10/02/preparedness-of-welders-with-formal-and-informal-training-to-handle-structural-construction-jobs-in-nigeria/

[23]. Ondieki, C. M., Bisanda, E. T., & Ogola, W. O. (2013). Effect of mode of training on product quality the case study of arc welding in small scale metalworking enterprises In Kenya. International Journal of Computational Engineering Research, 3(1), 235-41. http://www.ijceronline.com/papers/Vol3_issue1/AL03102350241.pdf