

Determinants of Compliance with the Occupational Health and Safety Practices among Metal Welders in Jinja Municipality-Jinja District Uganda

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Abstract

Background: Compliance with the occupational health and safety measures at workplace is an important step towards providing a healthier welding workplace; especially in developing countries like Uganda where such measures are commonly not well-considered.

Objective: The purpose of this study was to assess the work environment and individual determinants of compliance with the occupational health and safety practices among metal welders in Jinja municipality-Jinja district.

Method: The study adopted a cross-sectional survey design using both qualitative and quantitative method of enquiry. Simple random sampling and convenience sampling were used to assess the welders. Structured interviews and key informant interview were used to obtain data from the welders. Data analysis was done using the SPSS.

Results: Only 50% (120) of the welders in Jinja municipality complied with the welding occupational health and safety practices. Regularly checking and maintenance of welding plant and equipment ($p=0.000$, $X^2=33.771$), supervisor often remind workers of the potential risks and hazards in their workplace ($p=0.000$, $X^2=48.614$), supervisor always consulting welders for suggestions about how to improve safety ($p=0.004$, $X^2=8.103$), type of material used for welding ($X^2=10.112$, $p=0.006$) and the number of employees per welding enterprise ($X^2=18.898$, $p=0.008$) were the work environment conditions that had statistical significant influence on compliance to occupation health and safety practices among welders in Jinja municipality. Duration in the welding profession ($X^2=8.654$, $p=0.034$) and thought of getting injured easily while welding ($X^2=8.515$, $p=0.004$) were the individual factors that have a statistically significant influence on compliance to occupational health and safety practices among the welders in Jinja municipality.

Conclusion: There is an average level of compliance with occupational health and safety practices among welders in Jinja district. Basically only half of the welders in the Municipality are compliant mainly due to welding work environment characteristics/factors.

Recommendations: Orientation, awareness, development of standard rules, enforcement of the safety codes and conducts were the recommendations necessary to improve the compliance to occupational health and safety practices among welders.

Keywords: PPE; Welding; Occupational hazards; Risk; Compliance; Occupational safety

Background

Compliance with occupational health and safety measures at the workplace is an important step towards providing a healthier welding workplace; especially in developing countries like Uganda where such measures are not commonly considered. Some safety measures for welders include wearing eye goggles; face masks, gloves, ear plug, apron, and air filter [1]. Although in developed countries awareness and regulatory measures to adhere to safety precautions exist, in many developing countries they are still in a nascent stage of development as the majority of them come under the non-organized sector and safety precautions are not strictly implemented. Welding, a skilled profession has been practised since the ancient times [2]. Welders join and cut metal parts using a flame or an electric arc and other sources of heat to melt and cut or to melt and fuse metal [3].

The welding sector in Uganda is dominated by the informal sector with only a few industries where welding is carried out. Most of the welding sites are scattered along main roads from the city centre [4] in a study done in Jinja district, the results showed that 92% of the welders reported injuries or illnesses that they suspected of being caused by their work. Postulations have been made on why compliance with the guidelines is low among welders; some have mentioned issues to do with the work environment [5] while others have opined that the welders as individuals are to blame [6,5]. Hence the need for this

study to assess the work environment and individual determinants of compliance with the occupational health and safety practices among metal welders in Jinja municipality-Jinja district.

Methodology

Research design

The study adopted a cross-sectional study design with both quantitative and qualitative research approaches. The study population was among the metal welders working within Jinja municipality.

Eligibility criteria

Inclusion: Metal welders aged above 18 years, as these were able to consent, Metal welders who were operating within the sampled parish within Jinja district and Metal welders who consented to participate.

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Exclusion: Metal welders who did not consent participation and Metal welders who were below 18 years of age.

Sample size and sampling design: Sloven formula was used to determine the sample size of the study among the estimated number of welders in Jinja district (N) which is 600 welders [4]. Using this formula, therefore the sample size is 240 welders.

Sampling design: In this study, simple random sampling was used to sample all the welders in Jinja Municipality.

Data collection instruments: The questionnaire, observations checklist and interview guide were used to collect the data. Key informants were interviewed with the use of interview guide, questionnaires were used to ask relevant questions from the respondents (Welders) while observation checklist was used to observe safety practices among welders.

Data processing and analysis: Data analysis was done using the Statistical Package for Social Sciences, (SPSS). The univariate, bivariate and multivariate analysis were conducted. At univariate, frequency and percentages were controlled for. At bivariate chi-square and p-value were controlled for and at multivariate level odd ratio were controlled for.

Ethical considerations: A scientific and ethical approval was collected from Cavendish university ethical review board and permission to conduct the study was obtained from municipal council of Jinja district. Many of the potential ethical issues addressed while conducting the study were related to minimizing participant distress, thereby minimizing any harm to participants, voluntary participation, anonymity and confidentiality.

Study limitations: Some welding enterprise owners and manager were hesitant to participate in the study because of suspicions of the study however the researcher assured them that the study was for academic purposes only. The issue of language barrier also came up as a challenge; however, this was solved by hiring research assistants who understand the native language to interview the respondents who only comprehended their local languages.

Results

100% response rate was achieved during the study.

The level of compliance with the occupational health and safety practices among welders in Jinja municipality-Jinja district

The observational results revealed that only 50% (120) of the welders in Jinja municipality complied with the welding occupational health and safety practices (Figure 1).

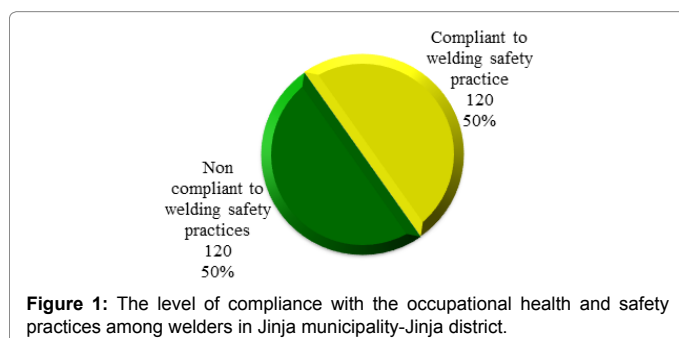


Figure 1: The level of compliance with the occupational health and safety practices among welders in Jinja municipality-Jinja district.

Regularly checking and maintenance of welding plant and equipment ($p=0.000$, $X^2=33.771$), supervisor often reminding workers of the potential risks and hazards in their workplace ($p=0.000$, $X^2=48.614$), supervisor always consulting welders for suggestions about how to improve safety ($p=0.004$, $X^2=8.103$), type of material used for welding ($X^2=10.112$, $p=0.006$), and the number of employees per welding enterprise ($X^2=18.898$, $p=0.008$) were the work environment conditions that have statistically significant influence on compliance to occupational health and safety practices among welders in Jinja municipality-Jinja district (Table 1).

Welding enterprises which had between 4-6 welders had employees who were 1.4 times more likely to comply with welding occupational health and safety practices ($OR=1.4$). Welders who agreed that their supervisors often reminded them of the potential risks and hazards in their workplace were three times more likely to comply with welding safety practices ($OR=3$). Welders who agreed that their supervisors consulted them had the least chances of complying with welding safety practices ($OR=3$) (Table 2).

The duration in the welding profession ($X^2=8.654$, $p=0.034$) and whether the welders thought they could be easily injured while welding ($X^2=8.515$, $p=0.004$) were the individual factors associated with the compliance to occupational health and safety practices among the welders in Jinja municipality (Table 3).

The results in the table above show that welder who had spent more than 10 years in the welding profession had the least odds of being compliant to occupational health and safety practices among welders in Jinja municipality-Jinja district, whereas welders who perceived that they cannot be easily injured while welding was 1.4 times more likely to comply with welding occupational health and safety practices (Table 4).

Discussion of Results

The level of compliance with occupational health and safety practices among welders in Jinja municipality-Jinja district

The result of this study shows that only 50% (120) of the welders in Jinja municipality complied with the occupational health and safety practices. The level of compliance obtained in this study is slightly higher than what was reported by [4] but lower than what was found by [7] in Nigeria. The finding of this study suggests that half of all the welders in Jinja municipality are not compliant to occupational health and safety precautions and this is the reason why there have been rampant reports of work-related injury among these welders in the municipality. Recent evidence shows that 92% of the welders in Jinja municipality report injuries or illnesses that they suspected of being caused by their work. Welders should avoid rolling up their sleeves and pant-cuffs because sparks or hot metal could deposit in the folds and cause burns, this too was not observed by the majority of the welders in the municipality.

Key informant interview results concurred to some extent with the results above, many of the key informants mentioned that the most welders never observed safety while carrying out the welding. One welding workshop owner stressed that; "This working place is not safe here, most of the welder's just care about having an electrode and welding metals together with or without safety gear".

| Condition | Compliance with occupation health and safety practices | | X ² | Sig. |
|--|--|---------------|----------------|--------|
| | Compliant | Non-compliant | | |
| Materials used for welding | | | | |
| Gas | 15(30.0%) | 35(70.0%) | | |
| Electrodes | 91(55.2%) | 74(44.8%) | 10.112 | 0.006* |
| Both | 14(56.0%) | 11(44.0%) | | |
| Number of employees | | | | |
| 4 – 6 | 14(58.3%) | 10(41.7%) | | |
| 7 – 9 | 12(42.9%) | 16(57.1%) | 18.898 | 0.000* |
| 10 – 12 | 9(21.4%) | 33(78.6%) | | |
| More than 12 | 85(58.2%) | 61(41.8%) | | |
| Have established procedures for cutting and welding | | | | |
| Agree | 95(51.9%) | 88(48.1%) | 1.127 | 0.288 |
| Disagree | 25(43.9%) | 32(56.1%) | | |
| Have welding activities manager/ supervisor in this place | | | | |
| Agree | 100(51.5%) | 94(48.5%) | 0.968 | 0.325 |
| Disagree | 20(43.5%) | 26(56.5%) | | |
| Employers give PPE to employees when needed | | | | |
| Agree | 44(48.4%) | 47(51.6%) | 0.159 | 0.690 |
| Disagree | 76(51.0%) | 73(49.0%) | | |
| Welding plant and equipment regularly checked and properly maintained | | | | |
| Agree | 36(30.8%) | 81(69.2%) | 33.771 | 0.000* |
| Disagree | 84(68.3%) | 39(31.7%) | | |
| Supervisor often reminds workers of the potential risks and hazards in their workplace | | | | |
| Agree | 34(27.9%) | 88(72.1%) | 48.614 | 0.000* |
| Disagree | 86(72.9%) | 32(27.1%) | | |
| Supervisor consults welders for suggestions about how to improve safety | | | | |
| Agree | 45(40.2%) | 67(59.8%) | 8.103 | 0.004* |
| Disagree | 75(58.6%) | 53(41.4%) | | |
| Reporting a safety problem in unit will not result in negative repercussions for the person reporting it | | | | |
| Agree | 103(51.5%) | 97(48.5%) | 1.080 | 0.299 |
| Disagree | 17(42.5%) | 23(57.5%) | | |
| Co-workers take immediate actions to correct safety hazards/ risks they notice in this units | | | | |
| Agree | 88(48.9%) | 92(51.1%) | 0.356 | 0.511 |
| Disagree | 32(53.3%) | 28(46.7%) | | |
| As long as daily targets are achieved, my supervisor does not care whether we worked according to the safety rules or not | | | | |
| Agree | 79(52.7%) | 71(47.3%) | 1.138 | 0.286 |

| | | | | |
|--|-----------|-----------|-------|-------|
| Disagree | 41(45.6%) | 49(54.4%) | | |
| Provided with appropriate information, instructions and training to the workers | | | | |
| Agree | 79(52.7%) | 71(47.3%) | 1.138 | 0.286 |
| Disagree | 41(45.6%) | 49(54.4%) | | |
| Workplace has warning danger signs on all dangerous equipment | | | | |
| Agree | 48(51.1%) | 46(48.9%) | 0.070 | 0.791 |
| Disagree | 72(49.3%) | 74(50.7%) | | |

Table 1: Relationship between work environment conditions and compliance with the occupational health and safety practices among welders in Jinja municipality–Jinja district.

| | B | S.E. | Sig. | Exp(B) | 95.0% C.I. for EXP(B) | |
|---|-------|------|------|--------|-----------------------|-------|
| | | | | | Lower | Upper |
| Materials used for welding | | | | | | |
| Gas | .565 | .603 | .349 | 0.760 | .539 | 5.744 |
| Electrodes | -.055 | .494 | .912 | .947 | .360 | 2.491 |
| Both | | | | | | |
| Number of employees | | | | | | |
| 4 – 6 | -.782 | .512 | .126 | 1.457 | .168 | 1.247 |
| 7 – 9 | -.408 | .493 | .408 | .665 | .253 | 1.747 |
| 10 – 12 | .814 | .476 | .087 | 0.256 | .888 | 5.735 |
| More than 12 | | | | 1.000 | | |
| Welding plant and equipment regularly checked and properly maintained | | | | | | |
| Agree | 1.156 | .344 | .001 | 0.178 | 1.618 | 6.243 |
| Disagree | . | . | . | 1.000 | | |
| Supervisor often reminds workers of the potential risks and hazards in our workplace | | | | | | |
| Agree | 1.336 | .382 | .000 | 3.804 | 1.800 | 8.042 |
| Disagree | | | | 1.000 | | |
| Supervisor consults welders for suggestions about how to improve safety | | | | | | |
| Agree | -.122 | .334 | .716 | .885 | .460 | 1.704 |
| Disagree | | | | 1.000 | | |

Table 2: Binary logistic regression for the relationship between work environment conditions and compliance to occupational health and safety practices among welders in Jinja municipality–Jinja district.

The relationship between work environment conditions and compliance to occupational health and safety practices among welders in Jinja municipality–Jinja district

The results of this study show that welding enterprises which had between 4-6 welders had employees who were 1.4 times more likely to comply to welding occupational health and safety practices compared to welding enterprises which had a larger number of employees. The explanation for this finding is that with a small number of employees, the available resources in terms of equipment like PPE, eye goggles, safety boots and ear muffs can be adequately shared between the employees such that they can all have adequate safety gear. This is

| Characteristic | Compliance with occupational health and safety practices | | X ² | Sig. |
|--|--|---------------|----------------|--------|
| | Compliant | Non-compliant | | |
| Who is supposed to wear PPE | | | | |
| Workers in dangerous areas | 21(40.4%) | 31(59.6%) | | |
| All workers | 99(52.7%) | 89(47.3%) | 2.455 | 0.117 |
| Ever received training in welding safety | | | | |
| Yes | 31(51.7%) | 29(48.3%) | 0.089 | 0.776 |
| No | 89(49.4%) | 91(50.6%) | | |
| Duration in welding profession | | | | |
| Less than 1 year | 15(53.6%) | 13(46.4%) | | |
| 1 - 5 years | 51(56.0%) | 40(44.0%) | 8.654 | 0.034* |
| 6 - 10 years | 26(59.1%) | 18(40.9%) | | |
| More than 10 years | 28(36.4%) | 49(63.6%) | | |
| Satisfaction with being a welder | | | | |
| Very satisfied | 9(60.0%) | 6(40.0%) | | |
| Satisfied | 78(54.2%) | 66(45.8%) | 4.378 | 0.112 |
| Dissatisfied | 33(40.7%) | 48(59.3%) | | |
| Hours spent welding in a day | | | | |
| 1 - 5 hours | 4(40.0%) | 6(60.0%) | | |
| 6 - 10 hours | 97(52.4%) | 88(47.6%) | 1.927 | 0.382 |
| More than 10 years | 19(42.2%) | 26(57.8%) | | |
| Thought of being easily injured while welding | | | | |
| Yes | 102(55.1%) | 83(44.9%) | 8.515 | 0.004* |
| No | 18(32.7%) | 37(67.3%) | | |
| Been involved in a workplace accident | | | | |
| Yes | 73(49.7%) | 74(50.3%) | 0.018 | 0.895 |
| No | 47(50.5%) | 46(49.5%) | | |
| Suffered an occupational disease or from a suspected work-related illness | | | | |
| Yes | 75(53.2%) | 66(46.8%) | 1.393 | 0.238 |
| No | 45(45.5%) | 54(54.5%) | | |

Table 3: The individual determinants of compliance with occupational health and safety practices among welders in Jinja municipality-Jinja district.

not possible with a populated small welding enterprise were sharing of safety equipment can be challenging, thus causing non-compliance with safety practices.

The result of this study also shows that welders who disagreed that welding plant and equipment were regularly checked and properly maintained were more likely to comply with occupational health safety and practices during welding compared to welders who reported that that welding plant and equipment were regularly checked and properly maintained. This is because the equipment being used at the workplace is not maintained regularly, their levels of perception of susceptibility to work-related injury increases [8], such that they are more cautious while working, this makes them comply. This is contrary to what can happen if a welder thinks that the equipment being used is regularly maintained, they perceive less susceptibility to injury and are therefore less likely to comply.

It was also evident from the key informant interviews that equipment maintenance was not regularly done, only about half of the

| | B | S.E. | Sig. | Exp(B) | 95.0% C.I. for EXP(B) | |
|---|-------|------|------|--------|-----------------------|-------|
| | | | | | Lower | Upper |
| Duration in welding profession | | | .214 | | | |
| Less than 1 year | -.726 | .455 | .110 | 1.484 | .198 | 1.180 |
| 1 - 5 years | -.586 | .335 | .080 | 1.556 | .289 | 1.073 |
| 6 - 10 years | -.629 | .412 | .127 | 1.533 | .238 | 1.196 |
| More than 10 years | | | | | | |
| Do you think you can be easily injured while welding | | | | | | |
| Yes | -.742 | .357 | .038 | 1.476 | .236 | .958 |
| No | | | | | | |

Table 4: Binary logistic regression for the individual determinants of compliance with occupational health and safety practices among welders in Jinja municipality-Jinja district.

key informants mentioned that they maintained the equipment: “No, not regularly because of some challenges but most of these machines are long lasting and also the models we are using now are also a bit old so their spare parts are not available, we end up using them as they are for long” Manager.

The individual determinants of compliance with occupational health and safety practices among welders in Jinja municipality-Jinja district

The duration in the welding profession and whether the welders thought they could be easily injured while welding was the individual factors that have a significant relationship with the compliance to occupational health and safety practices among welders in Jinja municipality-Jinja district. The results further show that welder who had spent more than 10 years in the welding profession had the least odds of being compliant with occupational health and safety practices among welders in Jinja municipality-Jinja district. This is similar to the findings of a study carried out in Oyo state in Nigeria to assess the knowledge, attitude and compliance reported that compliance with preventive measures was found to be good among those who were more recently employed in the industry [9]. However, the finding is contrary to the findings by [7] who showed that 79(93.7%) of those who have spent more than 6years had a good compliance with occupational safety practices.

The findings of this study also showed that welders who perceived that they cannot be easily injured while welding was 1.4 times more likely to comply with welding occupational health and safety practices. This finding conforms to the health belief model by [10] were perceived susceptibility to a negative public health aspect increase compliance to set guidelines. This perception increases compliance to safety guidelines because innately the welder will know that he can get injured at any time for as long as he causes a lapse in his safety while welding, it, therefore, makes him use safety gear every time the welding is done. In addition, the interview with the key informants was highlighted below.

Further still, non-compliance with occupational health and safety was blamed on the welders themselves by the key informants, “You can’t blame management for non-compliance with safety among the welders, it is the welders themselves who do not care about their health, some of them think they can’t get injured and others consider the injuries to be minor for example when someone gets eye strain, they just take painkillers and tomorrow they will come back here and still weld without eye goggles” Manager.

During the key informant interviews, the issue of work experience also was discussed, the informants were asked what they thought was the effect of work experience on compliance to safety among the welders. This is what they had to say;

“I think with work experience comes more welding skill and safety practice, those welders who have welded for long have probably had chance to work with big companies or factories which emphasize safety so with so doing they get to know all the necessary safety gear to use and they use them, unlike the welders who are just starting out” Supervisor.

Conclusions and Recommendations

Conclusion

In Conclusion, only 50% (120) of the welders in Jinja municipality complied with the occupational health and safety practices. This reflects that 5 out of every 10 welders complied with the occupational health and safety practices.

Regular maintenance of welding plant and equipment, reminding of workers of the potential risks and hazards in their workplace by the supervisors, consultation of welders for suggestions about how to improve safety by supervisors, type of material used for welding, and the number of employees per welding enterprise were the work environment condition influencing the compliance to occupational health and safety practices among the welders in Jinja municipality.

The duration of the welding profession and whether the welders think they can be easily injured while welding was the individual factors influencing the compliance to occupational health and safety practices among the welders in Jinja municipality.

Recommendations

Strengthen the awareness and attitude of the welders by top management of the welding enterprises towards the practice of safety.

It is recommended that the Owners/managers of the welding sites in Jinja municipality conduct formal safety meetings with all their employees, such meetings are necessary for communicating safety information to all of them.

It is recommended for the welding enterprises to implement a system for safety incentive for the welders. It may not necessarily be the best tool to enhance compliance with occupational health and safety practices at the welding sites, but some form of incentive is important.

The government and the engineering societies should play a major role to apply the safety rules by issuing the regulations, standards and codes and legally enforced the welding enterprises to follow them with adequate strict penalties for noncompliance.

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