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Awareness of Occupational Injuries and Utilization of Safety Measures among Welders in Coastal South India

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Abstract

Background: Awareness of occupational hazards and its safety precautions among welders is an important health issue, especially in developing countries.

Objective: To assess the awareness of occupational hazards and utilization of safety measures among welders in coastal South India.

Methods: A cross-sectional study was conducted among 209 welders in Puducherry, South India. Baseline characteristics, awareness of health hazards, safety measures and their availability to and utilization by the participants were assessed using a pre-tested structured questionnaire.

Results: The majority of studied welders aged between 20 and 40 years (n=160, 76.6%) and had 1-10 years of education (n=181, 86.6%). They were more aware of hazards (n=174, 83.3%) than safety measures (n=134, 64.1%). The majority of studied welders utilized at least one protective measure in the preceding week (n=200, 95.7%). Many of them had more than 5 years of experience (n=175, 83.7%), however, only 20% of them had institutional training (n=40, 19.1%). Age group, education level, and utilization of safety measures were significantly associated with awareness of hazards in univariate analysis (p<0.05).

Conclusion: Awareness of occupational hazards and utilization of safety measures is low among welders in coastal South India, which highlights the importance of strengthening safety regulatory services towards this group of workers.

Keywords: Welding; Awareness; Utilization; Occupational injuries; Safety; India

Introduction

Welders are an important occupational group, especially in developing countries owing to rapid urbanization and industrialization, which leads labor-oriented markets to change

towards more automation and mechanization.¹ Occupational hazards contribute to 2.3% of disability-adjusted life year (DALY) lost among middle-income countries. Welders may be injured by flying sparks and particles of hot metal, ultraviolet radiation, and metal fumes, which

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may seriously threaten the arc welders' health.²

Adopting health promotional measures at workplace is an important step towards providing a healthier workplace, especially in developing countries where such measures are commonly not well considered.³ Some safety measures for welders include wearing eye goggles, face masks, gloves, ear plug, apron, and air filter. Although in developed countries awareness and regulatory measures to adhere to safety precautions exists, in many developing countries they are still in a nascent stage of development as majority of them come under the non-organized sector and safety precautions are not strictly implemented. The main reasons would include low level of education of workers, inadequate knowledge of health hazards and unavailability of preventive measures.

In spite of the major public health problems existing among welders, few studies have been conducted to assess the awareness and practice towards all relevant types of injuries and safety precautions in India.⁴⁻⁶ Studies of such nature will provide useful information in developing appropriate prevention methods. With this background, the current study was conducted to assess the awareness and practice of various types of safety measures among welders in coastal South India.

Materials and Methods

A total of 778 registered metal industries works in Puducherry, a district distributed over seven commune regions in coastal South India. We conducted a cross-sectional study among welders in Pondicherry commune and 174 registered metal industries were selected. This region was selected based on feasibility constraints. It would not affect the study outcome because of the comparable so-

ciodemographic and other parameters in these areas.

Considering an estimated relative frequency of 34.2% of those who practice at least one protective method,⁴ a required relative precision of 20%, (an absolute precision of 6.84%), and a response rate of 90% the minimum sample size was calculated to be 204.

At the first, all metal industries in Pondicherry commune were listed out serially using their register numbers. From the list, using a random number table, a metal industry was selected by simple random sampling. All workers with more than one year of experience in the selected metal industry were noted down. This procedure was continued until our sample size is met. This procedure has resulted in selection of 209 workers all of whom were included in the study. If the selected subject did not give consent or not accessible after two consecutive visits, the subject was considered as non-respondent.

The data was collected by administering a pre-tested questionnaire; necessary modifications were made according to field conditions. The baseline data were collected regarding socio-demographic variables including age, education level, and income. Data on awareness regarding injuries—eye injuries, mechanical injuries, skin problems, bodyache, *etc*—were also assessed. Awareness regarding safety measures like wearing goggles, face mask, gloves, boots, aprons, ear plugs, air filter and their availability and utilization were also evaluated. Utilization was classified according to use as “4–7 days,” “1–3 days,” and “never” among those to whom the safety measures were available in the preceding week.

Prior permission and clearance for the study was obtained from the institutional review board. Informed written consent was obtained from the study subjects and confidentiality was ensured.

Table 1: Number of people aware of occupational hazards among the 209 welders studied

Occupational hazard	n (%)
Eye injuries	159 (76.1)
Mechanical injuries	38 (18.2)
Pulmonary conditions	32 (15.3)
Body ache	26 (12.4)
Skin diseases	19 (9.1)
Cancer	7 (3.3)
Hearing problem	3 (1.4)
Any of the above	174 (83.3)

Statistical analysis

The collected data were entered in SPSS® for Windows® ver 16. Various factors associated with awareness of hazards including age, education level, utilization of safety measures, training, and work experience were assessed by univariate analysis. A p value <0.05 was considered statistically significant.

Table 2: Number of people awareness of safety measures among the 209 welders studied

Safety measures	n (%)
Goggles	123 (58.9)
Shield/mask	75 (35.9)
Gloves	44 (21.1)
Boots	26 (12.4)
Preventive and therapeutic medicines	6 (2.9)
Apron	0 (0)
Ear plug	0 (0)
Air filter	0 (0)
Any of the above	134 (64.1)

Results

All 209 selected welders completed the study, hence a response rate of 100%. All of the welders were males. The majority of them aged between 20 and 40 years (n=160, 76.6%), had 1 to 10 years of education (n=181, 86.6%). They were more aware of hazards (n=174, 83.3%) than safety measures (n=134, 64.1%). Although the majority of welders were aware of eye injuries (76.1%), less than 20% of them were aware of other hazards (eg, mechanical injuries, pulmonary injuries, skin disorders, etc) (Table 1). In terms of safety measures, around half of the welders (n=123, 58.9%) were aware of importance of wearing goggles, while only one-third (n=75, 35.8%) were aware of importance of wearing face mask or shield. Only few of studied welders were aware of importance of gloves (n=44, 21%) and boots (26, 12.44%) as protective devices. None of the welders were aware of protective effect of apron, ear plugs, and air filter (Table 2).

The majority of studied welders used at least one protective measure in the preceding week (n=200, 95.7%). Although goggles and face masks were available to more than 95% of the welders, less than half of them utilized goggles (n=86, 43%) and around two-thirds of them utilize face masks (n=136, 67.3%) for 4–7 days in the preceding week. Gloves were available to 108 welders out of whom 35 (32.4%) used them for 4–7 days in the preceding week. None of them had apron and air filter (Table 3). All the welders who aged >50 years or had more than 10 years of education were aware of the hazards. The majority of the welders had more than five years of experience (n=175, 83.7%), however, only 20% of them had institutional training (n=40, 19.1%). Age group, education level, and utilization of safety measures were significantly associated with the level of awareness of hazards in univariate analy-

Table 3: Availability to and utilization of safety precautions by the 209 welders studied

Safety measure	Availability	Utilization (when available)		
		4–7 days	1–3 days	Never
Eye goggles	200 (95.7%)	86 (41.1%)	105 (49.8%)	9 (4.3%)
Face mask/shield	202 (96.7%)	136 (65.1%)	64 (30.6%)	2 (1%)
Gloves	108 (51.7%)	35 (16.7%)	68 (32.5%)	5 (2.4%)
Boots	4 (1.9%)	4 (1.9%)	—	—
Ear plug	1 (0.5%)	—	1 (0.5%)	—
Apron	0 (0%)	—	—	—
Air filter	0 (0%)	—	—	—
Preventive and therapeutic medicines	0 (0%)	—	—	—
Storage area	30 (14.4%)	30 (14.4%)	—	—

sis (Table 4).

Discussion

There are few studies on the awareness of injuries and utilization of safety measures among welders worldwide. Some studies reported the level of awareness of safety measures for eye injuries among welders.⁷⁻⁹ The fact of low awareness of safety measures and the low frequency of their regular utilization are a matter of concern in our study. These may be due to various reasons like low level of education, lack of institutional training, age group structure and work experience along with non-adaptation of regulatory measures by concerned authorities on safety precautions. As the most of studied welders were working under unorganized sectors and had low income, it was understandable that their priorities would be things other than utilizing safety measures.

A study from Pakistan showed that only half of the welders studied believed that their occupation was hazardous for

their health.⁶ That was in contrast to our findings where more than 80% of studied welders were aware of the fact. Welders in Nigeria had a high level of awareness of

TAKE-HOME MESSAGE

- In developing countries awareness of occupational hazards and its safety precautions among welders is an important health issue.
- Occupational hazards contribute to 2.3% of DALY lost among middle-income countries.
- Flying sparks, particles of hot metal, ultraviolet radiation, and metal fumes may seriously threaten the arc welders' health.
- Low level of education, lack of institutional training, age group structure, low income and work experience along with non-adaptation of regulatory measures by concerned authorities on safety precautions are important factors.
- Enforcement of safety regulatory measures to control the informal occupational sectors should also be considered.

Table 4: Factors associated with awareness of welding hazards

Factors	Total	Number of subjects aware (%)	p value
Age group (yrs)			
20–29	90	79 (88)	<0.001
30–39	70	60 (86)	
40–49	35	21 (60)	
≥50	14	14 (100)	
Education (yrs)			
Primary school (1–7)	62	52 (84)	0.027
High school (8–10)	119	94 (79)	
>10	28	28 (100)	
Utilization of safety measures			
Yes	200	169 (85)	0.02
No	9	5 (56)	
Training			
Institutional	40	35 (88)	0.424
Apprenticeship	169	139 (82)	
Work experience (yrs)			
<5	34	32 (94)	0.064
≥5	175	142 (81)	

the risk of sustaining an eye injury (98%) from welding.⁹ Another study from Saudi Arabia reported that 9% of the workers had no knowledge of preventive measures.⁵ We found that around 75% of studied welders were aware of eye injuries, though their level of awareness about other types of injuries was very low. Although around half of the welders were aware of the importance of wearing goggles and to a lesser extent about facemask, the majority of them were unaware of other safety measures. This might be attributed to lack of institutional training coupled with other factors. Although goggles and face masks were available to more than 95% of studied welders, less than half of them used goggles (n=86, 43%) and

around two-thirds of them used face mask (n=136, 67.3%) for 4–7 days in the preceding week. That would be anyway, better than the Nigerian welders, only 34.2% of whom used one or more types of protective devices.⁴ Another study from Nigeria, also reported that while working, less than half of the welders used welding goggles, 45% used sun glasses, and the remaining 11% did not use any protective devices in the week preceding the survey; 65% of respondents reported that they did their job for a while without using eye protection.⁸ Although the majority of the welders working in South Africa wore protective devices while welding, a few did not use such devices, and others used sunglasses for protection.⁷ Another study from Saudi Arabia showed that about 12% of studied welders used personal protective measures all the time while 60% did not use any.⁵

As reported from Benin, Nigeria, the poor economic condition in the country may have played a major role in the availability and affordability of these important protective devices. The situation of the region where we studied is not so different. Only minority of the welders (n=16, 7.6%) had per capita income of more than 4000 rupees (US\$ 65).¹⁰ We also found that younger people and those with lower education had a significantly lower awareness of occupational hazards.

We may not generalize the our findings to other countries with different socio-demographic, political and regulatory characteristics. Nonetheless, the study provided valuable information for comparison on prevailing situation analysis of welders awareness of occupational risks and safety precautions, which can be utilized by concerned authorities for appropriate interventional measures.

In conclusion, occupational safety practices among the studied welders appeared to be inadequate to avoid occupa-

tional hazards. It is recommended that an educational campaign be launched for welders. Enforcement of safety regulatory measures to control the informal occupational sectors should also be considered.

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Conflicts of Interest: None declared.

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