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THE DETERMINATION OF OCULAR DISORDERS AMONG WELDERS IN THE SOUTHEAST OF IRAN

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ABSTRACT

Background: Welding, a widely used industrial process, is one of the most potential sources of visible and invisible optical radiation.
Objectives: The aim of the current study was to determine the prevalence of ocular disorders among welders and compare with a control population.
Methods: This cross-sectional study was held in Zahedan city, the capital of Sistan-and-Baluchestan province, southeast of Iran. There were two groups including welders (96 subjects) and non-welders (114 subjects) in this research. Participants were accidentally selected through a two-stage sampling method from two strata including welders and non-welders from January to May 2016. Inclusion criteria were no history of trauma, no ocular surgery, no systemic diseases that effect eye, and no use of drug that influence eye. Quantitative variables were described by mean ± standard deviation and qualitative variables were summarized using frequency and percentage indices. Odds Ratio (OR) and its 95% confidence interval were employed for showing association degree. Independent two-sample t-test was used for comparison mean groups. P-value less than 0.05 was considered to be significant and SPSS (ver. 16) software was used for the analysis.
Results: The mean ± SD age were 41.6±10.1 and 38.6±12.6 years old for welders and non-welders, respectively (P=0.06). Prevalence of cataract (OR= 4.79) and photo-kerato-conjectivitis (OR=2.11) were significantly different between two groups. The estimated OR were 4.79 and 2.11 for having cataract and photo-kerato-conjectivitis, respectively. Dry eye (54.6%), pingueculae (49%), and Photo-kerato-conjectivitis (32.3%) were the most prevalent eye disorders among welders.
Conclusions: it can be concluded that the welders should be given health related educations about the probable ocular risks of the distinct aspects of their occupation. Also the regular eye examinations and use of ophthalmic eye care services should be emphasized to all welders.

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Introduction

1. Background

Welding, a widely used industrial process, is one of the most potent sources of visible and invisible optical radiation (1). Welding releases a wide spectrum of radiations ranging between 200 nm and 1400 nm which involve ultraviolet (UV) rays (200-400 nm), visible light (400-700 nm) and infra-red rays (700-1400 nm) (2). There are three types of UV rays. UVA rays

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have the longest wavelengths, followed by UVB, and UVC rays which have the shortest wavelengths (3, 4). Note that both the sun and welding emit infrared radiation (5). Hence, welders are identified as a high risk group for eye disorders because of their exposure to UV rays and infra-red radiation.

Arc welding is more dangerous to ocular function than carbide welding (2). Visible light and infra-red penetrate to the retina may cause thermal or photochemical damage, based on the intensity and duration of exposure (6). Length of service and age are important factors to ocular disorders in the welding occupation. Studies also reported that long-term exposure to UV radiation is associated with disorders such as pterygium and pingueculae because of absorbance of the UVC light by cornea (7, 8). Yu et al. (2015) indicated that infrared radiation caused cataract in an animal study (9). In addition, exposure to welding light without suitable precaution may cause ocular disorders (2). Erhabor reported that 51.1% of the gas welders complained of eye irritation (10).

There are more than 3 million welders in the world and the use of welding has increased in recent years (11). In our knowledge, there is no comprehensive study from the southeastern region of Iran to determine whether occupational exposure to UV rays and infrared radiation increase the risk of ocular disorders.

1.1. Objectives

The objective of the current study was to determine the prevalence of ocular disorders among welders and compare with a control population. The findings of this study would provide a baseline data for southeastern region of Iran which can be used to develop eye health and preventing welding related occupational risks.

2. Methods

This cross-sectional study was held in Zahedan city, the capital of Sistan-and-Baluchestan province, southeast of Iran. There were two groups including welders and non-welders in this research. Participants were selected through a two-stage sampling method. Workers were accidentally selected from two strata including welders and non-welders. Welders were working in welding town of Zahedan and non-welder stratum included workers from flour factory, municipality, and other workers as the control group. Note that for controlling health worker effect between two groups, all control subjects were worker too. This study was conducted from January to May 2016.

Inclusion criteria were no history of trauma, no ocular surgery, no systemic diseases which effect eye, and no use of drug that influence eye. We designed a form for participants' information record. This form elicited information on personal characteristics, working history, and also ocular history. Visual acuity was measured with and without the participants' current glasses using the Snellen E-chart under standard light condition at a distance of 4 meters. Objective refraction was measured with auto-refraction (Topcon Auto Ref-keratometer, RM8800, Japan) and static retinoscopy (Heine Beta 200 retinoscope, HEINE Optotechnic, Germany) was performed for checking the results. In order to increase validity, the subjects underwent Cycloplegic refraction after receiving Cyclopentolate 1% drops. Refractive error degrees were transformed into spherical equivalent (SE=sphere+0.5×cylinder). SE less than -0.50 diopters (D) was defined as myopia, more than 0.50 as hyperopia, and between -0.50 and 0.50 as emmetropia. Anterior and posterior segment eye examination was done with Slit lamp biomicroscopy (Haag-Streit BM 900®, Bern Switzerland) and direct ophthalmoscopy (Heine Beta®200 Ophthalmoscope, HEINE Optotechnic, Germany). We used non-contact tonometer (CT-20) tool for assessment of intra-ocular pressure (IOP) of suspected individuals to glaucoma. Visual field was evaluated for all subjects by confrontational method. Afterwards, automatic perimetry was performed for suspected subjects. Color vision was also examined by Farnsworth D-15 test. All examinations were performed by two experienced optometrists.

Ethical approval of this study was obtained from the ethics committee of Zahedan university of medical sciences, Iran (Code: 7484). After explaining the objective of the study for all eligible individuals, they were asked to sign a written consent form to participate in the research.

Quantitative variables were described by mean ± standard deviation (SD) and qualitative variables were summarized using frequency and percentage indices. Odds Ratio (OR) and its 95% confidence interval (CI) were employed for showing association degree. Independent two-sample t-test was used for comparison mean groups. P-value less than 0.05 was considered to be significant and SPSS (ver. 16) software was used for the analysis.

3. RESULTS

A total of 96 welders and 114 non-welders were examined in the present study. All the participants were male. The age of respondents ranged from 19 to 75 years old. The mean ± SD age were 41.6±10.1 and 38.6±12.6 years old for welders and non-welders, respectively (P= 0.06). Table 1 indicates summary characteristics for two groups, separately. In addition, the mean hours of daily welding was 8.1±2.3. As well, the mean hours of daily working was 7.7±2.3 in control group which was not statistically different from welders (P= 0.29). Refractive error for right eyes of all participants accounted for 42 (43.85%) welders and 36 (55.3%) non-welders with visual impairment.

Demographic characteristics and possible confounding variables were adjusted and matched between the two groups in the design phase of the study (Table 1). There were no missing data in the variables of interest.

Table 1. Descriptive characteristics for welders and controls

Variables	Welders, n (%)	Control, n (%)	P
Literacy (illiterate)	6 (6.3%)	11 (9.6%)	0.37
Smoking (yes)	8 (8.3%)	16 (14%)	0.20
Underlying disease	8 (8.3%)	7 (6.1%)	0.54
Drug history	6 (6.3%)	13 (11.4%)	0.20
Refractive error			
Myopia	28 (29.2%)	41 (36%)	
Emmetropia	54 (56.3%)	51 (44.7%)	0.25
Hyperopia	14 (14.65%)	22 (19.3%)	

Frequency, OR, and 95 percent confidence interval for ten outcomes reported in table 2. The intervals which did not contain 1.0 represent association between being welder and related outcomes. Prevalence of cataract and photo-kerato-conjectivitis were significantly different between welders and non-welders. The odds of having cataract for welders was 4.79 times the odds for non-welders (OR=4.79). Moreover, the results indicated that having cataract increased with age enhancement. That is among welders, none of the younger-than-30 participants, 2 (18.2%) subjects between 30 and 40, 3 (27.3%) subjects between 40 and 50, and 6 (54.5%) individuals older than 50 had cataract. Furthermore, the odds of having photo-kerato-conjectivitis for welders was 2.11 times the odds for non-welders (OR=2.11). Conversely, since the 95% CI for OR contains 1.0 for other eight outcomes, it is plausible that the true odds of having them due to UV were equal for welders and non-welders.

Table 2. Relationship between ocular diseases and occupational group

Type of eye disease	Welders, n (%)	Controls, n (%)	Odds ratio	95% CI[1]
Dry eye	53 (54.6)	72 (63.7)	0.69	0.39-1.19
Pingueculae	47 (49)	69 (60.5)	0.63	0.36-1.08
Photo-kerato-conjectivitis	31 (32.3)	21 (18.4)	2.11*	1.12-4
Pterygium	12 (12.5)	18 (15.8)	0.76	0.35-1.67
Cataract	11 (11.5)	3 (2.6)	4.79*	1.30-17.70
Corneal opacity	5 (5.2)	2 (1.8)	3.08	0.58-16.23
Abnormal Visual field	2 (2.1)	6 (5.3)	2.61	0.52-13.24

Photophobia	2 (2.1)	5 (4.4)	0.46	0.09-2.40
Blepharitis	2 (2.1)	0 (0)	1.02	0.99-1.05
Color vision defect	1 (1.1)	0 (0)	1.01	0.99-1.03

1: Confidence interval; *: $P < 0.05$

4. Discussion

The results of the current study indicated that dry eye (54.6%), pingueculae (49%), and Photo-kerato-conjectivitis (32.3%) were the most prevalent eye disorders among welders. In the study of Ajayi and Omotoye, pingueculae (50.1%) and pterygiun (17.5%) constituted the most prevalent eye disorders (5). Doughty and Oblak (12) reported pingueculae whereas Ichiro and Shun'lchi mentioned pterygium as the highest prevalent eye disorders (5). The possible explanation for these results could be the different weather conditions among regions (12). Note that southeast of Iran accounts for one of the driest regions of Iran.

The prevalence of photo-kerato-conjectivitis was 32.3% and 18.4% between welders and control subjects, respectively. The estimated OR of 2.11 (95% CI: 1.12-4) indicated that the odds of having photo-kerato-conjectivitis for welders was 2.11 times the odds for non-welders. The results of the current study also revealed a significant distinct proportions of cataract between two comparison groups. The estimated prevalence were 11.5% and 2.6% between welders and control participants, respectively. Furthermore, the estimated OR of 4.79 (95% CI: 1.30-17.70) showed that the odds of having cataract for welders was 4.79 times the odds of controls. These results were in agreement with some studies (2, 13, 14). This finding may be due to the inappropriate use of personal safety equipment. Likewise the results of the present study indicated that only about 28% of welders were always wearing eye protection glasses. Other studies confirmed that cataract is a multifactorial disease related to family history of cataract, increasing age, exposure to UV rays, previous eye inflammation or trauma, previous eye surgery in the posterior part of the eye, prolonged use of corticosteroid medication, diabetic, and smoking (11, 15).

The current research indicated no substantial difference in prevalence of pterygium between two groups. Outdoor working of both groups and the same weather conditions might be the possible reasons (16). Although the present study did not show a significant difference in proportion of corneal opacity between welders and control individuals, the estimated prevalence of having corneal opacity was in agreement with Alakija (1%) (17) , Okoye (2.7%) (18) and Aigbotsua (0.5%) (5). Corneal opacity in all affected welders might be a secondary to the previous superficial foreign body and burns from arc rays during welding activities.

Note that there were no remarkable limitation in the current study.

4.1. Conclusion

Based on the results, it can be concluded that the welders should be given health related educations about the probable ocular risks of the distinct aspects of their occupation. Also the regular eye examinations and use of ophthalmic eye care services should be emphasized to all welders.

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Conflict of interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

References

1. Kozłowski C. UV radiation emitted by selected sources at work stands. International journal of occupational medicine and environmental health. 2001;14(3):287-92.

2. Davies K, Asana U, Nku C, Osim E. Ocular effects of chronic exposure to welding light on calabar welders. Nigerian Journal of Physiological Sciences. 2007;22(1-2).
3. Van Kuijk F. Effects of ultraviolet light on the eye: role of protective glasses. Environmental health perspectives. 1991;96:177.
4. Heydarian S, Mahjoob M, Gholami A, Veysi S, Mohammadi M. Prevalence of color vision deficiency among arc welders. Journal of optometry. 2016.
5. Iyiade AA, Omotoye OJ. Pattern of eye diseases among welders in a Nigeria community. African health sciences. 2012;12(2):210-6.
6. Fich M, Dahl H, Fledelius H, Tinning S. Maculopathy caused by welding arcs. Acta ophthalmologica. 1993;71(3):402-4.
7. McCarty C, Taylor H. A review of the epidemiologic evidence linking ultraviolet radiation and cataracts. Progress in lens and cataract research. 35: Karger Publishers; 2002. p. 21-31.
8. Sliney DH. How light reaches the eye and its components. International Journal of Toxicology. 2002;21(6):501-9.
9. Yu Z, Schulmeister K, Talebizadeh N, Kronschläger M, Söderberg P. Temperature-controlled in vivo ocular exposure to 1090-nm radiation suggests that near-infrared radiation cataract is thermally induced. Journal of biomedical optics. 2015;20(1):015003-.
10. Erhabor G, Fatusi A, Ndububa D. Pulmonary symptoms and functions in Gas welders in Ile Ife. Nig Med Pract. 1992;24(5/6):99-101.
11. Slagor RM, La Cour M, Bonde JP. The risk of cataract in relation to metal arc welding. Scandinavian journal of work, environment & health. 2016;42(5):447-53.
12. Doughty MJ, Oblak E. A clinical assessment of the anterior eye in arc welders. Clinical and Experimental Optometry. 2005;88(6):387-95.
13. Megbele Y, Lam K, Sadhra S. Risks of cataract in Nigerian metal arc welders. Occupational medicine. 2012;62(5):331-6.
14. Zamanian Z, Mortazavi SMJ, Asmand E, Nikeghbal K. Assessment of Health Consequences of Steel Industry Welders' Occupational Exposure to Ultraviolet Radiation. International journal of preventive medicine. 2015;6.
15. Asbell PA, Dualan I, Mindel J, Brocks D, Ahmad M, Epstein S. Age-related cataract. The Lancet. 2005;365(9459):599-609.
16. Ashaye A. Pterygium in Ibadan. West African journal of medicine. 1990;10(3-4):232-43.
17. Alakija W. Eye morbidity among welders in Benin City, Nigeria. Public Health. 1988;102(4):381-4.
18. Okoye O, Umeh R. Eye health of industrial workers in Southeastern Nigeria. West African journal of medicine. 2001;21(2):132-7.