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Original Article

Risks of Cataract in Metal Arc Welders in Kishanganj, Bihar

Reena Kumari[1], Navneet Kumar[2], Sayan Hazra[2], Uttam Kumar Paul[3], Arup Bandyopadhyay[4]

[1]Assistant Professor, Department of Ophthalmology, MGM Medical College, Kishanganj, Bihar, India, [2]Post-graduate Trainee, Department of General Medicine, MGM Medical College, Kishanganj, Bihar, India, [3]Professor, Department of General Medicine, MGM Medical College, Kishanganj, Bihar, India, [4]Professor, Department of Physiology, MGM Medical College, Kishanganj, Bihar, India

Abstract

Background: It is believed that welders are at a greater risk of developing cataract. In this study, we have endeavored to look for definite evidence for this issue.

Materials and Methods: A study was conducted on male welders and control subjects (not engaged in welding) from construction companies and welding workshops in Kishanganj, Bihar. A questionnaire was used to gather information about their work and lifestyle, as also their occupational, medical, and ocular histories. Cataract was identified by external examination and ophthalmoscopy.

Results: The study was conducted on 37 welders and 100 controls. The study showed that the welders were at the higher risk of developing cataract.

Conclusions: Our study shows that the incidences of cataract were higher in welders than in controls. However, the exact cause behind this increased prevalence of cataract in welders could not be elucidated in this study. Yet, it can be suggested that the welders need more rigorous eye protection.

Key words: Cataract, Metal arc welding, Ultraviolet radiation

INTRODUCTION

Manual metal arc welding (MMAW) is a process whereby two metal parts are joined together. The more common welding processes can be classified as arc welding, gas welding, resistance welding, energy beam welding, and solid-state welding.[1] Our focus, in this study, is on MMAW only.

Ultraviolet (UV) and other visible radiations are supposed to be the main factors causing eye damage.[2] UV radiation is absorbed by the cornea and lens, but maximally by the crystalline lens of the eye because it absorbs maximum radiation at wavelengths around 400 nm. Eventually, this absorption leads to cataract formation causing some chemical changes in the lens.[2-4]

On a global scale, cataract is one of the leading causes of blindness, accounting for 48% of blindness worldwide.[5] Although cataract is said to be a disease of the old age, yet in developing countries, cataract does occur at an earlier age.[6]

Unoperated cataract, still today is the globally largest cause of blindness.[6] It is, therefore, relevant to earmark the common etiological factors for cataract and find a process of prevention. Welding is supposed to be one preventable cause and needs attention. The other causes include age, sex, family history, lifestyle (smoking and alcohol), nutrition, diabetes, corticosteroid use, and severe dehydration.[7] The occupational causes are UV radiation,[8] infrared radiation, ionizing radiation,[9] wood smoke,[10] and trauma.[11]

Earlier studies on welders focused on the respiratory health effects and relatively little work has been done on the welder's risk of developing cataract. However, one

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Corresponding Author: Arup Bandyopadhyay, Department of Physiology, MGM Medical College, Kishanganj - 855 107, Bihar, India. Phone: +91-9830243034. E-mail: arupbanerjee1953@gmail.com

study was done in Nigeria,[12] which however, was not a very elaborate one and therefore, this effort of ours.

MATERIALS AND METHODS

The proposed subjects, materials and methods are as follows:

Study Setting

The study was conducted in the Department of Ophthalmology, MGM Medical College and L.S.K. Hospital, Kishanganj, Bihar, involving persons working as welders in various construction industries and welding workshops in Kishanganj. Proper approval from Ethical Committee of the institution was obtained before starting the actual study.

Time Lines

The study was done between January and October, 2016.

Description of Population

The study was conducted on male metal arc welders working for at least 1 year in the occupation as case, and normal adult male healthy subjects as control-all aged between 18 and 60 years. The study was conducted only after explaining the purpose and the procedure of the study to both cases and controls and obtaining written consent from each of them.

Inclusion Criteria

1. Normal male healthy adult subjects (18-60 years age) as controls
2. Welders of the above age group and male sex without any notable diseases such as essential hypertension, cardiac diseases, pulmonary diseases, and diabetes mellitus.

Exclusion Criteria

1. Persons below 18 years
2. Old aged persons above 60 years age
3. Persons with essential hypertension, cardiac diseases, pulmonary diseases, and diabetes mellitus
4. All females.

Sample Size

A total of 100 male subjects as controls and 37 welders as cases.

Study Design

It was both community and institutional based, observational, and cross sectional study.

Parameters to Re Studied

1. Detailed history including duration of working as welders
2. Relevant clinical examination
3. Anthropometry (body weight and height)
4. Detailed eye examination.

Study Stools

1. Consent form
2. Questionnaire including pro forma for history and clinical examination
3. Clinical record book
4. Instruments for clinical examination, *viz.*,
   a. Snellen chart
   b. Jaeger chart
   c. Humphrey's visual field analyzer
   d. Streak retinoscope
   e. Ophthalmoscope: Direct and indirect
   f. Fundus lens
   g. Fundus fluorescent angiography instrument.

History of the participants was collected in a semi-structured questionnaire followed by an eye examination, both done in the institution. The questionnaire sought information on smoking status, medical and family history, eye symptoms and injuries, and particulars of occupation, and work environment. A cataract was defined as lens opacity ≥5% of the lens "surface" on retro-illumination.[13]

In statistics, only a comparison between the numbers of cataract-affected persons in the two groups was performed.

RESULTS

The final result of our study is shown in Figure 1. The study was done on 37 welders (mean age: 39.7 ± 9.6 years) and 100 controls (36.2 ± 7.8 years). All participants were male. Particulars about their occupation are detailed in Table 1. There was no difference in terms of age, smoking habits, prevalence of diabetes, daily working hours and habitats between welders and controls, except history of eye injury which was more common in welders (17% vs. 3%). The

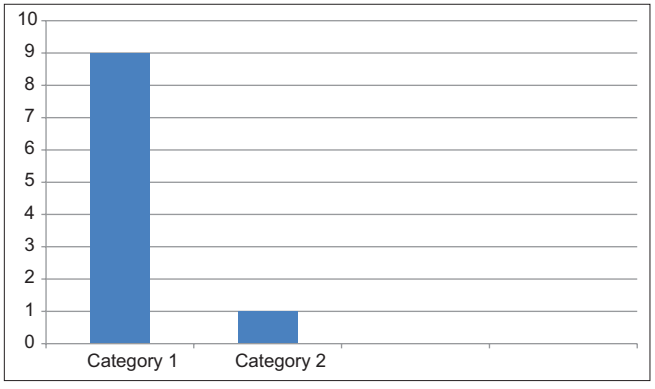

Figure 1: Comparison of cataract prevalence between welders and controls. Category 1 = Welders; Category 2 = Control

Table 1: Particulars about occupation

Occupation	Numbers	Mean age (years)	Mean working time (h)
True welders	37	39±9.6	9.2±1.1
Outside workers	100	36.2±7.8	9.0±1.5

incidences of different eye symptoms - such as eye-ache, excessive tears, sensation of foreign bodies in the eye, and photophobia - were significantly the higher among welders compared with controls (all $P < 0.001$). Examination of their eyes revealed that cataract was more prevalent among welders compared to controls (9% vs. 1%; $P < 0.05$).

DISCUSSION

In our study, it has been shown that cataract was more prevalent among welders, compared to controls although both the groups were almost similar in all other respects. However, our study was not so designed as to understand the physico-chemical principles behind such findings, nor could it be used as an evidence to say that increased UV radiation is the cause behind increased number of cataracts in welders.

A study by Davies *et al.*[12] was done to compare the ocular side effects between welders and controls in Nigeria. Their study also showed a significant difference between welders and controls for cataract (2.5% vs. 0%) and was comparable to ours. However, their study was not very elaborate either. Some other studies have reported cataracts among arc welders also, and the number of cases of cataract has been observed to increase with years in welding. In 1986, a Bulgarian study reported radiation cataract in 24% of arc welders who had been welders for at least 10 years.[14] A more recent study by the same authors[15] reported a cataract prevalence of 38% among 522 workers exposed to different sources of non-ionizing radiation, which included welding. This prevalence is much higher than ours.

CONCLUSION

It has been conclusively proved by our study that welders from Kishanganj have an elevated risk of developing cataracts. However, the role of UV radiation in cataract formation in welders cannot be proved from this study, as increased incidences of ocular injury could also be a precipitating factor. However, this can at least be inferred from our study that since both cataract and ocular injuries are more common in welders, the welders should take much more protections while working. For this, a more rigorous training and legislation might be necessary.

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