

Complaints of Photokeratitis in Welding Informal Industry Workers in Bandung City

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ABSTRACT

As many as 37% of all cases of head injuries are cases of eye injuries. 1790 cases of eye injury were experienced by welders, solderers, and metal cutters, and around 1390 cases of eye injury were caused by exposure to welding sparks. Informal sector welding workers have a high risk of photokeratitis. In the informal welding industry along Jalan Bogor, Bandung City, there is an extreme level of risk. One of the extreme risks is photokeratitis caused by the welding process (UV exposure). This study uses a quantitative approach, with this type of observational research. The population in this study were workers in the informal welding sector in Jalan Bogor, Bandung City. The sample size is 60 workers obtained through the purposive sampling technique. The variable in this study was the complaint of photokeratitis. Data collection used a questionnaire with 7 questions about photokeratitis complaints. Descriptive analysis was used in this study, the data is presented in tabular form which can explain the distribution of photokeratitis complaints and the distribution of photokeratitis categories among workers. The results of this study can be concluded that the most dominant photokeratitis complaint experienced by workers is visual disturbances such as blurred vision or unclear vision with the number of workers experiencing symptoms as much as 34 or 56%. The least common symptom experienced by workers is that their eyes water a lot, only 9 workers or 15%. In the results of categorizing photokeratitis complaints, there were 60% of workers had photokeratitis complaints. Employers need to pay full attention to this case, one thing that can be done is to provide Eye Protection Equipment and adjustments to working time or duration of exposure.

KEYWORDS: complaints of photokeratitis, informal, welding

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INTRODUCTION

The workplace is a location where the three components of work interact, including people, tools, and materials. The interaction of the three can have different consequences, where the interaction between humans and materials can cause Occupational Diseases. Occupational Diseases can occur in all workplaces, in essence, PAK is a disease condition caused by a substance related to work. A disease is said to be PAK if the specific cause is in the workplace. (1)

One of the workplaces that have the potential to cause PAK is welding. Welding is a joining process between two pieces of metal to form the desired shape. (2) The welding process itself begins with the preparation of the material, followed by cutting the material, then the material is welded, and lastly is the finishing hold. (3)

Ultraviolet (UV) radiation generated from welding can cause acute disorders in the workplace such as photokeratitis as a form of eye injury which often causes a decrease in the ability to see. The effects of UV radiation cause symptoms such as sore, watery, gritty eyes and photophobia (4). Bureau of Labor Statistics (BLS) data on occupational injuries and diseases shows that as many as 37% of all cases of head injuries are eye injuries. 1790 eye injury cases were experienced by welders, solderers, and metal cutters, and around 1390 eye injury cases were caused by exposure to welding sparks which caused welder's flash/photokeratitis. (5) The results of previous studies in the informal welding industry along Jalan Bogor, Bandung City show that occupational safety and health risks are ranging from low to extreme levels. One of the extreme risks is

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photokeratitis caused by the welding process (UV exposure). (6)

Photokeratitis is damage to the cornea of the eye caused by light, which results from excessive exposure to sunlight or other artificial sources of UV light. UV rays that are captured by the eye will be absorbed by the outermost tissue layer of the cornea and conjunctiva. The symptoms are redness of the eyeball, pain in the eye, the eye feeling gritty, lots of tears, and blurred vision. (7)

Photokeratitis is an eye injury that often results in loss of sight, at least half of all accidents and illnesses that have occurred. Approximately ¼ of injuries to the eye are work-related injuries. Approximately 40% of all work-related eye injuries result in permanent vision damage (APHA). In general, eye pain and decreased visual acuity occur about 6-12 hours after injury. (8)

MATERIAL AND METHODS

This study uses a quantitative approach, with this type of observational research. The population in this study were workers in the informal welding sector in Jalan Bogor, Bandung City. The sample size of 60 workers was obtained through a purposive sampling technique with the inclusion criteria: as full-time permanent workers and have worked for at least 6 months, and the exclusion criteria: not having chronic eye health problems.

The variable in this study was the complaint of photokeratitis. Data collection used a questionnaire with 7 questions about

photokeratitis complaints including, visual disturbances, discomfort in the eyes such as a foreign object, pain in the eyes, glare, lots of tears, feeling hot/burning in the eyes, and eyelids feeling swollen.

Photokeratitis is divided into two categories, namely, there are complaints and there are no complaints. There is a complaint determined if there are at least 3 symptoms after welding. Determination of photokeratitis complaints using at least 3 symptoms is done because if only 1 or 2 symptoms could these symptoms are not photokeratitis symptoms but other eye injury symptoms. (2,9)

Descriptive analysis was used in this study, the data is presented in tabular form which can explain the distribution of photokeratitis complaints and the distribution of photokeratitis categories among workers. This research has complied with the research ethics rules with ethically proper number No.102/KEPK/STIKI/VII/2022.

RESULTS

Researchers collected data regarding subjective complaints of photokeratitis with a questionnaire based on the symptoms of photokeratitis complaints felt by the welder after welding. The period of complaints experienced was during the last 3 months. Determination of complaints also looks at whether the symptoms that arise are felt for 6-12 hours and disappear within 48 hours later

Table 1. Distribution of Photokeratitis Complaints

No	Symptoms Experienced	n	Percentage (%)
1	Impaired vision (blurred/unclear)	34	56.7
2	Discomfort/feeling of a foreign object in the eye like sand	26	43.3
3	Pain in the eyes	30	50
4	Glare	29	48.3
5	Lots of tears	9	15
6	Feel hot / burning in the eye	31	51.7
7	The eyelids feel swollen	23	38.3

Based on table 1, it shows that of the 60 workers observed, 56.7% felt disturbances when seeing, such as blurred/unclear vision. There 43.3% of workers feel uncomfortable / feel there is a foreign object in the eye such as sand. 50% of workers feel pain in the eye. 48.3% felt glare, 15% shed lots of tears, 51.7% felt hot/burning eyes, and 38.3% of workers

felt swollen eyelids. Based on these results the most common symptom of photokeratitis experienced by workers is visual disturbances such as blurred/unclear eyes. While the complaints experienced by workers are a lot of tears with 15%.

Table 2. Distribution of Photokeratitis Complaint Categories

Photokeratitis Complaints	n	Percentage (%)
No Complaints	24	40.0
There are complaints	36	60.0
Total	60	100

Based on table 2, shows that the majority (60%) of informal welding workers in the city of Bandung have photokeratitis complaints, namely as many as 36 workers. Meanwhile, 40% of the workers had no complaints, namely as many as 24 workers.

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DISCUSSION

Welding is still one of the most needed industries, welding in the informal sector mostly serves small-scale production, for example, iron fences, iron stairs, iron ceilings, and the like. As with other industrial workers, welding workers are not free from the risk of fatigue. One type of fatigue is eyestrain. Eye fatigue occurs because of using the visual function intensively, thus triggering a decrease in visual endurance. Eye fatigue can occur in the welder because the appearance of sparks from the welding creates a high light intensity in the welder's field of view. The light emitted from welding can affect eye fatigue and complaints of photokeratitis. (10)

Informal sector welding workers in the city of Bandung, based along Jalan Bogor, Bandung City, provide welding services such as the manufacture of iron fences, window bars, awnings, iron stairs, ceilings, and so on. In general, workers come Monday to Friday with an average working hour of 8 hours/day, but sometimes up to 9-10 hours depending on the amount of work. Regarding the control of occupational health risk factors, based on information from the Chairperson of the local Welding Association, it was explained that there had not been any efforts to control occupational safety and health awareness either from the public health center or the local government. This is reinforced by the results of observations which show that workers do not understand aspects of occupational health, especially the risk of photokeratitis.

Photokeratitis is an inflammation that occurs in the cornea due to light or light, which is most often caused is ultraviolet light. Welding has several effects that can be experienced on the eye if it is too often exposed directly to foreign objects such as welding sparks, infrared rays, and ultraviolet rays. These effects consist of acute effects and chronic effects. In acute effects, exposure to ultraviolet radiation that occurs will affect eye fatigue which is characterized by blurred vision, reddened eyes, and twitching of the eyelids. This condition will be felt several hours after exposure and will continue for up to 24 hours. Furthermore, in chronic effects, there will be eye abnormalities and possible swelling of the eyelids. (11)

In this study, the most dominant photokeratitis complaint experienced by workers was visual disturbances such as blurred vision or unclear vision, with 34 or 56% of workers experiencing symptoms. Then the second most common complaint is that the eyes feel hot or feel a burning sensation in the eyes with the number of workers experiencing symptoms of 31 workers or 51.7%. Next, the third most common complaint is a pain in the eyes, the number of workers who experience symptoms is 30 workers or 50%. Other symptoms such as discomfort/feeling that there is a foreign object in the eye such as sand, a feeling of glare, lots of tears, and the eyelids feeling swollen are not too dominant, only less than half of the workers experience these symptoms. The least common symptom experienced by

workers was that their eyes watered a lot, only 9 workers, or 15% experienced this.

As it is known that UV (Ultraviolet) radiation in welding is included in UVC radiation with short wavelengths. UVC radiation is the most damaging type of UV radiation. Although not considered a risk for skin cancer, UVC rays can cause severe damage to human eyes and skin. In the welding process, one of the exposed parts of the body is the eye, the eye is a very important part of the body. If the eyes are exposed directly to UV rays, this can cause eye problems. Therefore, it is necessary to use protective glasses or commonly called goggles along with a welding helmet. (12)

In this study, the categorization of photokeratitis complaints was carried out based on the presence or absence of complaints experienced by workers. Workers are categorized as having complaints if at least 3 symptoms are found after welding. The results show that 60% of workers have complaints of photokeratitis, where the most dominant complaint is visual disturbances such as blurred vision or unclear vision. Complaints of blurred vision are one identical symptom due to the acute effects of UV exposure. (13)

At the time of observation, it was found that most of the informal sector welding workers in the city of Bandung did not use PPE such as goggles while working, this certainly could increase the level of risk of photokeratitis complaints in workers. In addition, the welding location is on the shoulder of the road and semi-outdoor so that apart from UV exposure from welding, UV exposure from the sun is also added. So, it is considered important that every worker uses protective equipment to minimize the risk of photokeratitis complaints.

Workers who have complaints of photokeratitis continue to work, this can certainly increase the risk of complaints getting worse. Workers will continue to be exposed to UV rays, as it is known that the intensity of light that arises from welding ranges from 500 lux to 18000 lux. The intensity of the welding light can vary depending on the type of welding machine, type of work, and type and thickness of the material being welded. The high intensity of welding light can trigger light contrast. The light produced from welding contains ultraviolet radiation (200–400 nm), visible light radiation (400–700 nm), and infrared radiation (700–1400 nm). (14)

Contrast is a condition in which there is a difference in the brightness level between the object of view and the surrounding environment. In general, the contrast will be felt by workers in the form of a glare response. Glare itself is divided into two types, namely discomfort glare and disability glare. Discomfort glare causes a feeling of discomfort in the eyes (visual discomfort). Visual discomfort will be increasingly felt if exposure to bright visible light occurs for a long period. In disability glare, a person will experience temporary blindness due to exposure to very bright visible light or commonly known as flash blindness. This means that the possibility of experiencing photokeratitis is higher. (15)

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Complaints of photokeratitis can disappear by themselves, meaning that workers only need to reduce contact with sources of danger, by using PPE, reducing exposure time (welding), and can temporarily stop working if deemed necessary. In conditions where workers want to do treatment, this can be done by placing a cold washcloth over the closed eye, using artificial tears, taking certain pain relievers as recommended by the ophthalmologist, and using antibiotic eye drops if the doctor recommends it. (16)

CONCLUSION

Based on the results of this study, it can be concluded that the most dominant photokeratitis complaint experienced by workers is visual disturbances such as blurred vision or unclear vision with the number of workers experiencing symptoms as much as 34 or 56%. Then the second most common complaint is that the eyes feel hot or feel a burning sensation in the eyes with the number of workers experiencing symptoms of 31 workers or 51.7%. The least common symptom experienced by workers was that their eyes watered a lot, only 9 workers, or 15% experienced this. In the results of categorizing photokeratitis complaints, there were 60% of workers had photokeratitis complaints.

REFERENCES

- I. Rahayu, Tristanto. Analisis Faktor Yang Berhubungan Dengan Penyakit Akibat Kerja Pada Karyawan Smelter 'X' Industri Tahun 2020. *J JOUBAHS*. 2022;1(2):156–67.
- II. Laila NN. Keluhan Fotokeratitis Pada Mata Pekerja Las Sektor Informal di Kelurahan Cirendeuh dan Ciputat Tangerang Selatan. In: *Prosiding Seminar Nasional IKAKESMADA "Peran Kesehatan dalam Pelaksanaan SDGs*. 2017. p. 199–204.
- III. Fernandes R, Yohanes. Eksperimental Kecepatan Elektroda Las Busur Listrik Menggunakan Sliding Adaptive Two Axis Pada Sambungan Mild Steel ASTM A36. *Jom FTEKNIK*. 2020;7(2):1–8.
- IV. Rahmi M, Wiedartini, Disrinama AM. Analisis Pengaruh Faktor Individu dan Lingkungan Kerja Terhadap Gangguan Photokeratitis Pada Pengelasan FCAW. In: *Proceeding 2nd Conference On Safety Engineering*. 2018. p. 587–92.
- V. JJ White. Eye Injury Statistics [Internet]. 2018 [cited 2020 Apr 25]. Available from: <https://www.jjwhiteinc.com/2017/08/09/eye-injury-statistics/>
- VI. Suherdin, Sutriyawan A, Natagerara AA. Hazard Identification and Risk Assessment of Workers in the Welding Informal Industry in Greater Bandung, Indonesia. *Himal J Community Med Public Heal*. 2022;3(5):34–48.
- VII. Hastin H, Asfian P, Prasetya F. Analisis Faktor Yang Berhubungan dengan Keluhan Subjektif Fotokeratitis Pada Pekerja Pengelasan di Kota Kendari Tahun 2020. *J Keselam dan Kesehat Kerja Univ Halu Oleo*. 2022;1(117–124).
- VIII. Kurniawan AF, Ma'rufi I, Sujoso ADP. Gejala Fotokeratitis Akut Akibat Radiasi Sinar Ultraviolet (UV) Pada Pekerja Las di PT. PAL Indonesia Surabaya. *J IKESMA*. 2017;13(1):22–31.
- IX. Yuda NAP. Faktor Risiko yang Berhubungan dengan Keluhan Fotokeratitis pada Pekerja Pengelasan. *Medula*. 2018;8(1):117–21.
- X. Sundawa E, Ginanjar R, Listyandini R. Hubungan Lama Paparan Radiasi Sinar Las dengan Kelelahan Mata Pada Pekerja Bengkel Las Sektor Informal di Kelurahan Sawangan Baru Dan Pasir Putih Kota Depok Tahun 2019. *Promot J Mhs Kesehat Masy*. 2020;3(2):196–203.
- XI. Nadu SM, Salmun JARS, Setyobudi A. Gambaran Faktor Risiko Penurunan Daya Penglihatan Pada Pekerja Bengkel Las Di Kecamatan Oebobo. *Media Kesehat Masyarakat*. 2022;4(1):122–30.
- XII. Muliana, Subagiada K, Natalisanto AI. Menentukan Tingkat Intensitas Radiasi UV yang Diterima Pekerja Pengelasan dengan Titik Area Mata, Siku, Dan Betis. *Progress Phys J*. 2021;2(1):1–7.
- XIII. Izadi M, Jonaidi-Jafari N, Pourazizi M, Alemzadeh-Ansari M, Hoseinpourfard M. Photokeratitis Induced by Ultraviolet Radiation in Travelers: A Major Health Problem. *J Postgrad Med*. 2018;64(1):40–6.
- XIV. Hakim BN. Analisa Kelelahan Mata Disebabkan Radiasi Sinar Ultraviolet B (UV-B) Pada Pekerja Las di PT. Tri Karya Alam, Batam. *Sigma Tek*. 2021;4(1):39–44.
- XV. Setiawan D. Hubungan Antara Umur dan Intensitas Cahaya Las dengan Kelelahan Mata Pada Juru Las Pt. X Di Kabupaten Gresik. *Indones J Occup Saf Heal*. 2016;5(2):142–52.
- XVI. Kalis GS. Fotokeratitis: Gejala, Penyebab, Diagnosa, dan Pengobatan [Internet]. *Dokter Sehat*. 2020 [cited 2022 Dec 2]. p. 1. Available from: <https://doktersehat.com/penyakit-a-z/fotokeratitis>