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CHARACTERISTICS AND CAUSES OF WORK-RELATED EYE TRAUMA AT BEKASI REGENCY HOSPITAL

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ABSTRACT

To report and describe the characteristics and causes of work-related eye trauma cases at the Bekasi Regency Hospital. A retrospective descriptive study using secondary data derived from the medical records of patients diagnosed with work-related eye trauma at the Bekasi Regency Hospital for 5 years from 2020 to 2024. There were 66 subjects studied. The majority of subjects were male (78.8%, n = 52), and the mean age of patients was 28.1 ± 6.5 (range: 15-54), with the largest percentage being between the ages of 15 and 34 years (47%, n = 31). Most patients work as self-employed in machinery, metals, trade, and agriculture (45.5%, n = 30). The most common type of eye trauma was injury to the eyelid and adnexa (18.8%, n = 19), followed by open laceration/penetrating trauma of the eyeball (27.3%, n = 18). The most common mechanism of work-related eye trauma is eye impact by blunt or sharp objects (53%, n = 35), followed by injuries due to being stabbed by sharp objects during activities such as nailing (10.6%, n = 7), and due to exposure to cleaning or maintenance equipment (10.6%, n = 7). The mechanism of eye trauma due to cutting activities (6.1%, n = 4), welding (6.1%, n = 4), and exposure to chemical liquids (4.5%, n = 3) are other work-related mechanisms of eye trauma. Complaints of visual impairment were almost always present in all subjects who experienced work-related eye trauma (66.7%, n = 44). Most cases of work-related eye trauma at the Bekasi Regency Hospital require surgery (66.7%, n = 44). Measures are urgently needed to increase understanding of the importance of eye and vision safety in the work environment and implement effective prevention strategies for employers and workers. Occupational safety programs need to include specific training on eye protection in the workplace and educational campaigns to raise workers' awareness of the risks and prevention of work-related eye trauma.

KEYWORDS *eye trauma, work-related eye trauma, work accident, ocular trauma*

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INTRODUCTION

Work-related eye trauma is one of the main causes of ocular morbidity among workers, especially in the industrial and construction sectors (Ilhan et al., 2022). These incidents cause temporary or permanent visual impairment and impact worker productivity and the economic burden on both individuals and companies (Marques et al., 2021). Based on data from the World Health Organization (WHO), about 55 million cases of eye trauma occur every year, and almost 10% of them occur in the workplace (Barake et al., n.d.). Work-related eye trauma is a significant global health problem with a high prevalence, especially in the industrial and construction sectors (Ilhan et al., 2022). Global data shows that eye trauma accounts for about 22% of all injuries that occur in the workplace, with figures varying between countries depending on the employment sector and the implementation of occupational safety policies (Gobba et al., 2017). According to a report by the International Labor Organization (ILO), as many as 55 million cases of eye trauma occur every year in the world, and about 10% of them cause permanent visual impairment (Adhikari et al., 2024).

In Indonesia, the prevalence of work-related eye trauma is also quite high, especially in the construction, manufacturing, and agriculture sectors (Min et al., 2016). A retrospective study at the Cipto Mangunkusumo National General Hospital in 2023 reported that eye trauma accounted for 18% of all occupational injury cases referred to health services (Waterkamp et al., 2016). Data from the Indonesian Ministry of Manpower (2022) states that an average of 12,000 cases of eye trauma occur every year in Indonesia, with the majority experienced by male workers in the productive age range (20-40 years). Most injuries involve mechanisms such as the impact of sharp or blunt objects, exposure to chemicals, and injuries from the welding process (Pathak & Sriram, 2023). This high figure shows the need for greater efforts in worker education, the provision of PPE, and supervision of the implementation of occupational safety policies in Indonesia (Darusman et al., 2024; Hidayah & Zaman, 2022; Setyawan et al., 2020). In Bekasi Regency, work-related eye trauma is one of the significant health problems, especially in industrial areas with a high number of workers. Based on data from the Bekasi Regency Health Office, eye trauma accounted for around 15% of the total occupational injuries recorded in healthcare facilities in 2022. Until now, there is no data on the characteristics and causes of work-related eye trauma cases in Bekasi district. This study aims to analyze the epidemiology data, mechanisms, and characteristics of work-related eye trauma in the Bekasi Regency Hospital. It is expected to pave the way for preventive measures to be taken to address this public health problem.

RESEARCH METHODS

This study uses a retrospective descriptive. The data taken is secondary data derived from medical records from the Bekasi Regency Hospital. Before the research was carried out, approval from the board of the Research Ethics Committee of the Bekasi Regency Hospital had been obtained. The subject of the study was a patient who was a worker who came to the Bekasi Regency Hospital for examination with a diagnosis of eye trauma (orbital or social) due to traumatic events at work from January 2018 to December 2023.

Patients diagnosed with non-place-of-care eye trauma and untraceable medical records were excluded from this study.

Data Analysis

All data obtained in the study were recorded and analyzed using the SPSS 23 application. The numerical variables are *mean* and standard deviation (SD), while the categorical variables are frequency (n) and percentage.

RESULTS AND DISCUSSION

Demographic Data

There were 100 subjects included in eye trauma research at the Bekasi Regency Hospital from January 2018 to December 2023. Of these, 30 (30%) were not work-related eye trauma, and 4 (4%) had incomplete data, so they were excluded from the analysis. Finally, 66 eligible patients were subjects in this study.

Table 1. Sociodemographic characteristics of work-related eye trauma patients in the study.

Sociodemographic variables		n	%
Gender		52	78,8
	Man	14	21,2
	Woman		
Age			
	15-24	17	25,8
	25-34	14	21,2
	35-44	8	12,1
	>44	27	40,9
Work			
	Self-employed	30	45,5
	Laborer	8	12,1
	Builder/technician	20	30,3
	Office employees	6	9,1
	Others	2	3.0
Education level			
	SD	8	12,1
	Junior High School	17	25,8
	High School	39	59,1
	Bachelor	2	3,0
	Total	**66**	**100**

The majority of patients were male (78.8%, n = 52), and the mean age of patients was 28.1 ± 6.5 (range: 15-54), with the largest percentage being between the ages of 15 and 34 years (47%, n = 31). The highest educational background is high school (59.1%, n = 39). Most patients were self-employed in machinery, metals, trade, and agriculture (45.5%, n = 30) [Table 1].

Mechanisms and Causes of Work-related Eye Trauma

Eye impact by blunt or sharp objects was the most common mechanism of work-related eye trauma (53%, n = 35), followed by injuries due to being stabbed by sharp objects during activities such as nailing (10.6%, n = 7), and due to exposure to cleaning or maintenance equipment (10.6%, n = 7). The mechanism of eye trauma due to cutting (6.1%,

n = 4), welding (6.1%, n = 4), and exposure to chemical liquids (4.5%, n = 3) are other work-related mechanisms of eye trauma [Table 2]. The most common type of eye trauma was injury to the eyelid and adnexa (18.8%, n = 19), followed by open laceration/penetrating trauma of the eyeball (27.3%, n = 18). Complaints of visual impairment were almost always present in all subjects who experienced work-related eye trauma (66.7%, n = 44) [Figure 1]. The average early visual acuity is between 1.0 and 0.32 (39.4%, n = 26), and the final visual acuity is 1.0 – 0.32 (45.5%, n = 30). Most cases of work-related eye trauma at Bekasi Regency Hospital require surgical treatment (66.7%, n = 44).

Table 2. Mechanisms and causes of work-related eye trauma in research subjects.

Mechanism of injury	**N**	**%**
Welding/ grinding	4	6,1
Cutting and drilling	4	6,1
Nailing with a hammer	7	10,6
Exposed to chemical liquids	3	4,5
Hit by a non-specific object (blunt, sharp, hard)	35	53
Related to cleaning or maintenance equipment	7	10,6
Others	6	9,1

Table 3. The type of eye trauma related to work, sharp vision, and administration performed.

Trauma variables	**N**	**%**
Type:		
Chemical trauma	4	6,1
Laceration or penetration of the eyeball	18	27,3
Corneal abrasion, corneal corpus	10	15,2
Blunt trauma, contusio	9	13,6
Adnexal injury (eyelids, lacrimal)	19	28,8
Radiation trauma and others	6	9,1
Sharp initial vision		
1.0 – 0.32	26	39,4
<0.32 – 0.1	13	19,7
<0.1 – 0.03	5	7,6
<0.03 – 0.01	3	4,5
<0.01 – LP	15	22,7
NLP	4	6,1
Sharp final vision		
1.0 – 0.32	30	45,5
<0.32 – 0.1	8	12,1
<0.1 – 0.03	3	4,5
<0.03 – 0.01	3	4,5
<0.01 – LP	11	16,7
NLP	11	16,7
Governance		
Operative	38	66,7

Non-operative	28	33,3

*NLP = No Light Perception, LP: Light Perception

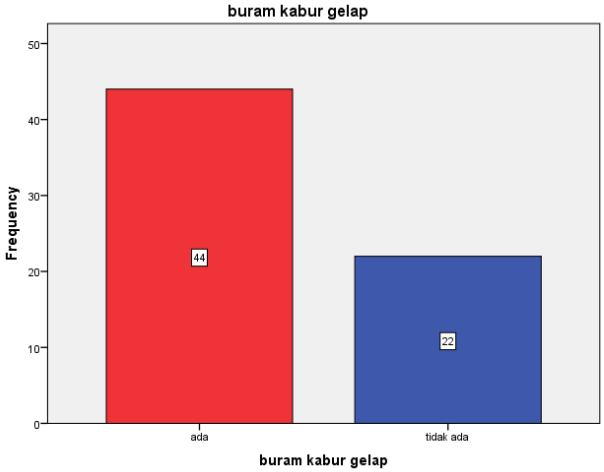

Figure 1. Graph table of the proportion of vision complaints in the study subjects.

Discussion

The study found that work-related eye trauma cases are more common in men and relatively in productive ages between 15-34 years. A similar prospective study conducted by Serinken in 2013 on workers who experienced work-related eye trauma in Turkey within 2 years found that work-related eye trauma cases were most common in young male workers. Several previous literature studies similar to this study have shown that young workers have a higher tendency to develop work-related eye trauma. In contrast, others show a higher level of risk in older workers. In this study, work-related eye trauma cases were significantly greater in men than in women, and men between the ages of 15 and 34 had the highest risk of eye injury. These findings suggest that eye safety programs in the workplace are important to develop, especially for certain tasks or types of work that are at high risk of work-related eye trauma regardless of gender and age.

In this study, most patients worked self-employed in various sectors such as machinery, metals, trade, and agriculture. This aligns with previous research by (NKEMAKOLAM, 2017), reporting that the sectors at high risk of work-related eye trauma are the manufacturing sector in Taiwan and the industrial and mechanical sectors in Tunisia. (Aroke, 2022). wrote that precision production, transportation, agricultural jobs, and the mining or construction industry also increase the risk of work-related eye trauma. In a study conducted by (NKEMAKOLAM, 2017), eye trauma in workers has a higher risk of occurring in workers without special occupational safety training, workers who do not use personal protective equipment, and those with more than five years of work experience. Unfortunately, in this study, data on the presence or absence of eye protection used and the length of work experience are not available. For the level of education, in this study, the average level of education in the research subject is high school. A 2016 study by (Jovanovic et al., 2016) on workers in Bosnia concluded that there is a relationship between education level and the incidence of work-related eye trauma. In contrast to previous research, research by (Lubis et al., 2018) did not find a correlation between education level and the incidence of eye trauma in carpenter workers. In line with the results of the study, in this study, work-related eye trauma incidents still occur a lot, even in workers with a fairly good level of education.

The most common trauma mechanism in this study is the impact of the eye by a blunt or sharp object, with the most common type of trauma being an adnexal injury, namely the eyelid and lacrimal system. Zghal-Mokni et al. reported that projectiles caused 70.5% of work-related ocular trauma cases. The most common lesion is the superficial foreign body cornea. At the same time, other studies show the most common cause of eye injury in industrial construction is flat lacerations, such as the superficial cornea of the foreign body, which is related to the work activities of grinding, cutting metal, welding, hammering, and drilling. This study also obtained the mechanism of work-related eye trauma in the form of welding, grinding, cutting, drilling, cutting, and nailing activities. In addition, in the subjects studied in this study, there is a mechanism that causes work-related eye trauma due to exposure to chemical liquids and is related to cleaning equipment or *maintenance*.

Other previous studies have found that the diagnosis of foreign bodies on the surface of the conjunctiva, corneal lacerations, corneal abrasions, blunt injuries, and burn chemicals are the main types of work-related eye trauma that occur quite frequently. The findings of this study are also similar to previous literature data that there is a mechanism for the eye to be exposed to foreign objects, hit by objects, and penetration/laceration of the eyeball contributes to most cases of work-related trauma. There was also radiation eye trauma, such as photokeratitis, in the subjects in this study.

The most common cases of work-related eye trauma in this study were adnexal injuries, including eyelids and lacrimal canals. In general, this type of eye trauma does not cause severe visual impairment. However, from all research subjects, there are also many cases of laceration or penetration of the eyeball, whereas, in the case of *open-globe injury*, there is usually a high risk of visual impairment to blindness. Based on *the Ocular Trauma Score*, the prediction of vision ability in cases of open eyeball trauma is poor and has the potential to result in blindness. Of course, this is something that needs to be avoided and prevented as much as possible in cases of work-related eye trauma in workers. A study conducted by (Cherry, 2018) found that penetrating trauma of the eyeball and foreign bodies in the eyeball ranked the highest cases of work-related open-eye trauma. Another study by (Beshay et al., 2017). reported that cases of eye injuries that are quite often hospitalized are open eyeball trauma and contusion.

In this study, the majority of subjects (44%) experienced visual impairment, such as blurred vision, even though the mild degree ranged from 1.0 to 0.32 visual acuity. Management is provided in the form of medication therapy and operative actions. Operative management is quite frequent (38%), usually in cases of eye trauma that requires actions such as suturing (*he*ating) or major eye surgery that requires hospital treatment.

Research limitations

The existence of other supporting data such as workplace-related information such as the absence of regulations and training in the workplace, the availability and compliance of wearing *eye-wear protection*, length of work experience, and worker-related causative factors such as carelessness, haste, lack of training, and lack of knowledge, will make the analysis and results of the information presented more accurate and complete. However, this information can be obtained if the regulatory system, administrative compliance, and distribution in each workplace and worker can be implemented properly. This is a challenge in itself in the future. Research on work-related eye trauma with a larger number of subjects on a national scale will also be very beneficial for improving occupational safety for workers in Indonesia, especially in this case, eye and vision health, which is a valuable asset for workers themselves.

CONCLUSION

Work-related eye trauma generally occurs in male workers of productive age, with the main causes being sharp or blunt object impacts, chemical exposure, and injuries from activities such as welding or cutting. The characteristics of these injuries vary from corneal abrasion to penetrating trauma that can potentially lead to permanent visual impairment. To reduce the number of incidences, strategic steps are needed in the form of occupational safety training focusing on eye protection, increasing access to and compliance with personal protective equipment (PPE), and education campaigns about the dangers and prevention of eye trauma. These efforts should involve collaboration between workers, employers, and regulators to create a safer work environment for sight. This research is expected to provide an overview and input for the improvement of systems and regulations in worker safety, especially eye and vision safety protection to be even better in the future, as well as open awareness of all parties about the importance of efforts to prevent and reduce the incidence of work-related eye trauma in Indonesia, especially in Bekasi Regency.

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