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Epidemiological Characteristics of Work-Related Ocular Trauma among the Carpenters in Medan, Indonesia

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Abstract

BACKGROUND: Medan is the capital of North Sumatera Province and the most industrialised area of North Sumatera. One of the largest industries in Medan is the wooden industry. Ocular trauma is often happened in Medan and causes a serious problem.

AIM: This study aimed to analyse the correlation between ocular trauma among the carpenters and the using of eye protection during work and educational level.

METHODS: This study is conducted among the carpenters that work in the wooden industry. There were 30 carpenters that being observed about age, educational level and working hours and the using of eye protection during work that might be related to ocular trauma. All carpenters completed a comprehensive examination and interview.

RESULTS: The most common age range of ocular trauma was between 26-45 years (56.7%), and all were male. Most of the traumatised carpenters educational level had a higher educational level (50%), and workers that had traumatised works more than 8 hours a day (66.7%). From this study, there was a significant correlation between ocular trauma among the carpenters and age ($p = 0.047$), and working hours ($p = 0.039$).

CONCLUSION: No significant correlation between ocular trauma among the carpenters and the using of eye protection during work ($p = 0.464$), and educational level (0.925) was found. Furthermore to anticipate the high rate of worked-related ocular trauma required labour regulations that cover the age of recruitment workers and working hours a day. Work safety regulation protects the workers from work-related ocular trauma.

Introduction

Eye injuries represent a frequent cause of emergency ophthalmic visits and have a significant impact regarding suffering, impairment of life quality, and the reduction of workability. Furthermore, eye injuries pose a relevant cost for the health system and result in a relevant loss of working days worldwide [1].

Injuries to the eyes accounted for 37 per cent of all head injuries involving days away from work in 2008 and 62 per cent of all. Face injuries involving days away from work. Men experienced far more eye injuries than a woman, and men age 25 to 44 suffered more eye injuries. Workers who were most at risk of incurring an eye included those in the manufacturing, construction, and trade industries, and those in the production, installation, maintenance and repair, construction and extraction, and service occupations [2]

Occupational ocular trauma is an important cause of preventable vision loss worldwide, with significant socioeconomic impact. It is a major cause of emergency ophthalmic visits and accounts for a substantial proportion of eye injuries, many of which occur in the workplace [3], [4].

More than 65,000 work-related eye injuries and illness are reported in the United States annually [5]. More than 2000 eye injuries occur at work daily, and approximately 10%-20% of eye injuries result in

temporary or permanent vision loss [5], [6]. Work-related injuries were noted to have a much higher incidence of intraocular foreign bodies and cataracts compared to non-work-related open globe injuries [7].

Ocular trauma is related to gender, age and educational level. In Northern Italy, the frequency of ocular trauma in younger workers (16-24 years old) is about double that of the oldest age class (55-64 years old) [8]. In the US population, men had a more than four times higher rate of an eye injury at work than women. Workers with less than a high-school education, non-Hispanic whites, self-employed, and in the Midwest region were more likely to experience ocular trauma with the highest rate in the age of 45-54 years [3].

Indonesia is an agrarian country. According to Indonesia's central statistics agency in February 2017, most Indonesian (31.86%) work in agriculture, as a farmer [9]. Only a few Indonesians are working as a carpenter. Moreover, being a farmer, carpenters or fishermen, having low educational attainment, and being men are positively associated with the frequency of injuries [10].

In Indonesia, the provision of working time has been established in Law no.13/2003 fourth Paragraph, article 77 verse 2, where entrepreneurs are required to the determine the working time of 7 hours a day and 40 hours a week in 6 working days [9].

We present the results of the study, an epidemiological characteristic of work-related ocular trauma among the carpenters in Medan the capital of Sumatera Utara province, one of the most densely populated and industrialised areas of Sumatera Utara, with a high number of active workers.

Material and Methods

This is a cross-sectional analysis study to describe epidemiological characteristics of work-related ocular trauma among the carpenters. The population of this study is all the carpenters that are working on the wooden industry in Medan, the North Sumatera capital, on January-December 2017. A total of 30 carpenters who worked in 6 working days. Data was directly obtained from all the carpenters that got an ocular trauma by using questionnaire and interview. The selected variables are the following:

1. Age: age of injured worker, distributed into 3 groups: (≤ 25), (26-45), (≥ 46).

2. Educational level, distributed into 2 groups: low (no school, primary school, junior high school), high (senior high school, bachelor).

3. Working time, distributed into 2 groups: (≤ 7 hours a day), (more than 7 hours a day).

4. Obedience using of eye protection devices during work into 2 groups: obey, not obey.

All samples in this study received a comprehensive ocular examination at H. Adam Malik Hospital Medan and a face-to-face interview. H. Adam Malik General Hospital is a government hospital, teaching hospital grade A in Medan North Sumatera. The samples were the carpenters who got an eye injury or ocular trauma at work or during working time. The ocular trauma includes penetrating injury, laceration, intraocular foreign bodies, etc., that caused by blunt or sharp trauma, and chemical trauma. The characteristics data were analysed by using univariate analysis and the correlation between all the variables, and worked-related ocular trauma was analysed by using bivariate analysis with Spearman correlation. Confidence intervals of 95% were employed. All significance values (ρ) were two-sided. Significance values (ρ) less than 0.05 were considered statistically significant.

Results

From 1 January to 31 December 2017 there were 28work-related ocular trauma among the carpenters. All carpenters that were observed during the study were male.

1. Work-related ocular trauma among the carpenters based on the age

From this study, the age of 26-45 years was the most common age of group (56.7%) followed by ≤ 25 years and ≥ 46 years.

Table 1: Distribution of Work-related ocular trauma among the carpenters based on the age

Variable (age)	Total (n)	Percentage (%)	Correlation Coef.	Sig. (2-tailed)
≤ 25	7	23.3		
26 – 45	17	56.7	0.365*	0.047
≥ 46	4	13.3		
Total	**28**	**93.3**		

More than 50% (56.,7%) carpenters were in the age between 26-45. There was a statistically significant correlation between age and work-related ocular trauma among the carpenters with significance values was 0.047 ($\rho < 0.05$).

2. Work-related ocular trauma among the carpenters based on the educational level

Table 2: Distribution of Work-related ocular trauma among the carpenters based on the educational level

Educational Level	Total (n)	Percentage (%)	Correlation Coef.	Sig. (2-tailed)
High	13	43.3	0.018	0.925
Low	15	50		
Total	**28**	**93.3**		

From Table 2 the Carpenters with low educational level most often experience ocular trauma (50%), but there was no statistically significant correlation between educational level and work-related ocular trauma among the carpenters with significance values was 0.925 ($\rho > 0.05$).

3. Work-related ocular trauma among the carpenters based on the working time

Table 3: Distribution of Carpenters-related trauma based on working time

Working time (hours)	Total (n)	Percentage (%)	Correlation Coef.	Sig. (2-tailed)
< 7	8	26.7	0.378*	0.039
≥ 7	20	66.7		
Total	**28**	**93.3**		

From Table 3 the Carpenters who work more than 7 hours a day tend to have an ocular trauma (66.7%) than those who work less than 7 hours a day. There was a statistically significant correlation between working time and work-related ocular trauma among the carpenters with significance values was 0.039 ($\rho < 0.05$).

4. Work-related ocular trauma among the carpenters based on the using of eye protection

Table 4: Distribution of carpenters-related trauma based on the obedience using of eye protection devices

Obedience	Work-related Ocular Injury		p-value
	Yes, n (%)	No, n (%)	0.464
Obey	6 (100%)	0 (0%)	
Not obey	22 (91.7%)	2 (8.3%)	

The carpenters that didn't obey of using eye protection devices more likely suffer from ocular injury 22 (91.7%). There are 2 carpenters that did not obey using eye protection devices, but they didn't get an ocular injury (8.3%). However, the chi-squared test data shows there was no statistically significant correlation between obedience using of eye protection devices and work-related ocular trauma among the carpenters($\rho > 0.05$).

Discussion

Indonesia is a developing country which most of the population live from agricultural products. This study to find out workers other than farmers that associated with the occurrence of ocular trauma in Medan. Limited study about the work-related ocular trauma among the carpenters Indonesia. In previous studies reported, male workers are most frequently involved [12], [13], [14]. From this study, we found that all subjects are male (100%), because wooden workers are usually male, and most of the Indonesian woman work as housewives or indoor workers. The highest frequency of ocular trauma among the carpenters in Medan is in younger workers (26-45 years old) 56.7%, and the lowest frequency is in oldest workers (≥ 46 years old) 13.3%. A study in Australia about 80% of worked-related ocular injuries occurred to persons aged between 20 and 44 years [11]. In the Southwest region of China, the highest proportion of occupational eye trauma was observed in the group between 36 and 45 years of age [12]. A similar study in Turkey, males was significantly greater than that for females, and males between 25 and 34 years of age had the highest eye injury rate [13]. This study also indicated that the risk of exposure to ocular trauma is inversely proportional to the job experience and young workers with little experience had a higher risk of exposure.

The educational level also plays an important rule in work-related ocular trauma. This study showed that Carpenters with low educational level most often experience ocular trauma (46.7%), but there was no statistically significant correlation between educational level and work-related ocular trauma — the workers with low educational level less understanding of the importance of using safety goggle during work.

Another variable that been examined in this study is working hours. Carpenters who work more than 7 hours a day tend to have an ocular trauma (66.7%) than those who work less than 7 hours a day. There was a correlation between working time and wok-ocular trauma in this study ($\rho < 0.05$). The Indonesian government issued a regulation the provision of working time in Law no.13/2003 fourth Paragraph, article 77, verse 2, that every entrepreneur is under an obligation to observe the ruling concerning working hours and required to determine the working time 7 (seven) hours a day and 40 (forty) hours a week for 6 (six) workdays in a week; or 8 (eight) hours a day, 40 (forty) hours a week for 5 (five) workdays in a week [9]. This regulation protects the workers from overtime working, so the incidence of work-related trauma in Indonesia may be reduced significantly. Another study that is held by the U. S. Department of Health and Human Services, overtime work was also associated with increased morbidity and mortality [15]. A study in Taiwan indicated that eye protection devices could reduce the risk of work-related eye injury by up to 60%, but only 18.4% of workers were wearing eye protection devices when injured [16]. In this study, we found that most of the carpenters who did not obey using eye protection devices likely suffer from ocular injury (91.7%) than others who obey (8.3%). A study in Iran, work-related eye injury is the major cause of eye injury and most often occurs as a result of the lack of proper eye protection [17]. A study in Scotland, UK, only 10 out 12 (83%) of workers were documented as wearing eye protection at the time of injury [18]. A study in Taiwan indicated that eye protection devices could reduce the risk of work-related eye injury by up to 60%, but only 18.4% of workers were wearing eye protection devices when injured [16].

In conclusion, this study provides insight into the epidemiological characteristics of occupational ocular trauma in Haji Adam Malik General Hospital, North Sumatera, Indonesia. Our research indicates that male worker, age and overtime working were a significant risk factor for work-related ocular trauma among the carpenters in Medan, North Sumatera.

These findings suggest that extensive occupational eye safety programs could be arranged and these should focus on the specific tasks or kinds of work with a high risk of ocular trauma, regardless of sex, age, educational level, working time, safety goggle and safety regulation. The incidence of work-related ocular trauma can be avoided through proper regulations, an improvement of work safety climate, rules and the entrepreneur under strict supervision by the government, so that the workers can work well and more prosperous.

Not only Safety regulation for workers such as using eye protection devices during work is needed, but also safety training and compliance within the workplace should be provided.

Author Contributions

Rodiah Rahmawaty Lubis and Arlina Nurbaity Lubis conceived, designed the study and also revised the final manuscript, analysed the clinical and occupational data and wrote the paper. Rodiah Rahmawaty Lubis, Ruri Putri and Vera made the ophthalmic examinations of the patients and recorded the data.

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