



The Effect of Length of Work on Dry Eyes Disease in Madurese Becak Workers, Sumenep Regency

Bragastio Sidharta, RA¹, Erlinda Manggarsari², Hanna Cakrawati³

¹Department of Ophthalmology, University of Muhammadiyah Malang

²Medical Science Education, Muhammadiyah University of Malang

³Department of Medical Physiology, University of Muhammadiyah Malang

Email: hanna.bdz@gmail.com

Received : Jan 25th2023. Revised : Apr 4th2023. Published: Jun 30th2023.

DOI: <https://doi.org/10.22219/sm.Vol19.SMUMM1.29244>

ABSTRACT

Dry eye disease (DED) is a disorder of the tear film caused by reduced tear production giving complaints that the eyes feel dry, and gritty and cause a burning sensation, which is one of the reasons patients come to see a doctor. The causes of DED are very multifactorial where ocular, anatomical, systemic, and environmental factors have been reported by several studies which state that there is a relationship between environmental factors such as pollutants from motorized vehicles having a role in the incidence of increased DED. Sumenep Regency was once a city of a thousand pedicabs and until now they are still the favorite choice for the people there. This research is an analytic observational with a cross-sectional approach. Data on the characteristics of the study subjects, length of work, and degree of DED complaints were collected and DED complaints were assessed using the Ocular Surface Disease Index (OSDI) questionnaire. The data were processed and analyzed using the Spearman correlation test to determine the effect of length of service on the level of DED complaints. A moderate strength (Spearman correlation = 0.441) relationship exists between the length of work and the degree of DED complaints in pedicab drivers.

Keywords : dry eye disease; pedicab drivers; ; length of working ; Eye Surface Disease Index (OSDI)

Copyright © 2023, Bragastio Sidharta, RA. et al
This is an open access article under the CC-BY-SA license

INTRODUCTION

Dry eye disease (DED) also known as dry eyes syndrome (DES) is a disorder of the tear film caused by reduced tear production giving complaints that the eyes feel dry, gritty and cause a burning sensation, which is one of the reasons patients come to see a doctor and become a problem for health. Other dry eye cases reported have symptoms of fibrous discharge, temporary blurred vision, redness, and hardening of the eyelids (Youran C, Jintao W, Jiixin Z, 2022). As a result of this condition, patients with DED experience a decrease in quality of life and a decrease in abilities related to doing work using sight. including aspects of physical functioning, social, psychological, daily

activities and productivity at work. In addition, DED has a socio-economic impact (Uchino M, Schaumberg DA, 2013).

DED generally occurs in Asia, as study reports report that the prevalence of DED in Asian countries is greater than in Western countries (Um SB. et al, 2014). This poses a serious problem as a personal and social burden. The prevalence of DED has been reported to range from 4.4% to 50% among middle-aged and older people worldwide (Bjerrum KB, 1997). With the global aging trend, the prevalence and burden of DED is also likely to increase. The cause of DED is very multifactorial in which ocular, anatomical and systemic factors play an important role. Several studies have reported that there is a relationship between environmental factors such as pollutants from motorized vehicles having a role in the incidence of increased DED. The surface of the eye which includes the epithelial layers of the cornea and conjunctiva, nerves, and lacrimal tears serves as a barrier to chemicals, microbes, water, and other substances to protect the eye (Sridhar MS, 2018). A healthy eye must maintain eye surface moisture under various conditions so as to allow it to remain in a homeostatic state without symptoms of various physical and biological aggressions. The ocular surface is a structure that is very vulnerable to exposure to air pollutants because it is always in direct contact with the environment and airborne materials. Air pollutants and weather conditions can affect the tear film and the health of the eye surface, affecting the ability of the eye to lubricate and reduce protective function. Overall, they found that air pollution and weather conditions (temperature, humidity, wind, sunlight, moisture) have an effect on the manifestation of DED symptoms and signs (Mandell JT. et al, 2020). Air pollution is an increasing global concern, especially outdoor air pollution in low society countries and indoor air pollution in high softening countries.

Madura Island, especially Sumenep, has a geographical plateau and the weather with the rainy season is usually overcast, the dry season is usually windy and partly cloudy, and is generally hot and stinging all year round. Throughout the year, temperatures usually vary from 25°C to 33°C and rarely go below 23°C or above 35°C. Sumenep was once a city of a thousand pedicabs and until now they remain a favorite choice for the people there even though their presence is slowly declining due to the increasing development of motorized vehicles (Sridhar MS, 2018). These workers who work outside daily and are exposed to air pollutants, with the majority being male and middle-aged are included in a group with high risk factors for DED (Shah AM, Galor A, 2021).

METHODS

This research is an analytic observational with a cross-sectional approach. Determining the sample size using the correlation analytic formula obtained by a number of 100 people. This research has been declared ethically passed by the Health Research Ethics Committee with No.E.5.a/094/KEPK-UMM/VII/2022. The research sample is pedicab workers in Sumenep Regency using a purposive non-random sampling method. The inclusion criteria include male

workers who are active pedicab drivers, male and pedicab drivers who are directly exposed to external environmental conditions. Exclusion criteria included pedicab pedal workers who smoked, were over 50 years old, used contact lenses and glasses, had a history of eye surgery, had a history of previous eye disease, and took drugs that could reduce tear production. Appropriate sample size sample data were collected from Ocular Surface Disease Index (OSDI) questionnaire interviews for assessing perceptions of DED. The hypothesis in this study was tested using the Spearman correlation statistical test, the data collected will be analyzed using SPSS for the correlation test (statistical test is significant if $p < 0.05$).

RESULTS AND DISCUSSION

The research was conducted in August 2022 on 100 pedicab drivers in Sumenep district, East Java who fit the inclusion criteria. There were no respondents who dropped out during the research process.

Table 1. Distribution of Respondent Characteristics

Age (year)	n	%
30 - 40 years	11	11
41 - 50 years	77	77
51 - 65 years	12	12
Total	100	100
Length of working (year)	n	%
<5 years	35	35
5 – 10 years	31	31
>10 years	34	34
Total	100	100

Source: Processed primary data

Based on table 1, productive age is the working age that can produce goods and services in the age range of 15-64 years (Central Statistics Agency, 2023). In this study, it was found that the majority of the age distribution of pedicab pedal workers in Sumenap Regency was in productive age with the majority age being 41-50 years old (77%) followed by 51-60 years old (12%). Age 41-50 according to the Indonesian Ministry of Health (2009) enters late adulthood towards early elderly and ages 51-60 years enter early elderly towards late elderly.

Table 2. Distribution of Dry Eye Disease Complaints

Degree of Complaints of Dry Eye Disease	n	%
Normal	60	60
Light	11	11
Currently	12	12
Heavy	17	17
Total	100	100

Source: Processed primary data

Based on DED complaints (table 2), information was obtained that 60 people (60%) did not complain about DED, then for those who complained of DED complaints with a severe degree (17%) was the largest number.

Table 3. Characteristics of Respondents based on Age and Complaints Degree of Dry Eye Disease

Age	Degree of Dry Eye Disease				Total
	Normal	Light	Currently	Heavy	
30 – 40 years	11 (100%)	0 (0%)	0 (0%)	0	11
41 – 50 years	44 (57.1%)	11 (14.3%)	10 (13%)	12 (15.6%)	77
51 – 65 years	5 (41.7%)	0 (0%)	2 (16.7%)	5 (41.7%)	12
Total	60	11	12	17	100

Source: Processed primary data

Based on the age group and the degree of DED complaints (table 3), it was found that the majority of respondents did not complain of DED when compared to those who did. However, in the early elderly age group towards late old age, an increase was found in the number of respondents complaining of DED. The prevalence of DED, according to other research reports, will increase significantly with age and DED is less common in research subjects with higher education (Malet F, et al, 2014). Epidemiological studies have shown that the incidence of DED increases with age associated with aging which is the cause of increased free radicals and oxidative stress due to decreased endogenous body antioxidants which in turn are associated with inflammation (Jie et al. 2009; Kruk et al. 2015).

Table 4. Characteristics of Respondents based on Length of Exposure and Degree of Dry Eye Disease Complaints

Length of working	Degree of Dry Eye Disease				Total
	Normal	Light	Currently	Heavy	
<5 years	30 (85%)	2 (5.8%)	1 (2.9%)	2 (5.8%)	35
5-10 years	17 (41.2%)	7 (20.6%)	4 (11.8%)	3 (8.8%)	34
>10 years	13 (42%)	2 (6.4%)	5 (16.1%)	14 (45.2%)	31
Total					100

Source: Processed primary data

Based on the length of work group and the degree of DED complaints (table 4), the largest percentage was the group of <5 years of service, namely 35 people (35%), the >10 years group had a percentage of 34 people (34%), while the 5-10 years group had a percentage of 31 people (31%). According to Tarwaka (2010), the working period is categorized into 2, namely the new working period is ≤ 5 years and the old working period is > 5 years. In this study, it was found that the working hours of the majority of pedicab drivers were included in the long working period (65%). It is known that the majority of respondents, as many as 60 people (60%) did not complain about DED and for those who did complain about DED entering severe DED, the highest number was 17 people (17%). In this study descriptively, it shows that the majority of respondents do not complain of DED even though the respondents are pedicab workers who are very at risk of being exposed to various external environmental factors such as temperature, humidity, UV rays and air pollutants. According to data obtained from IQAir (2023), air quality in Sumenep is AQI US 42 with good air pollution levels and the main pollutant PM2.5. Weaknesses in this study, there are several factors such as climate measurements that are not monitored, we did not examine the level of pollution and lifestyle. It was reported in several literatures, one of them by Seen S and Tong L (2018), that environmental factors are often involved and have an impact on the incidence of DED cases such as exposure to pollutants, temperature (extreme temperatures), reduced relative humidity, ultraviolet (UV) radiation and ozone because these factors increase oxidative stress and inflammation on the ocular surface (16). Galperin's research (2018) explains that exposure to motor vehicle exhaust can cause DED depending on the concentration level of each compound in motor vehicle exhaust, the higher the concentration level of the compound, the higher the DED symptoms will appear. Measuring the level of concentration of motor vehicle smoke compounds on a regular basis can control existing DES events (Galperin et al., 2018). In addition, this difference in incidence is also thought to be related to several other factors that influence DED in the study population, such as ethnicity.

Table 5. Spearman Correlation Analysis

		Spearman
		<i>Dry Eye Syndrome</i>
Correlation Coefficient	Sig 2	.441
N		.000
		100

Source: Processed primary data

Based on the results of the Spearman statistical test between length of work and the degree of DED (table 5), it shows that the significant value of the research is 0.000, where this result is a value less than 0.05. So it can be concluded that there is a significant relationship between length of work and the degree of DED complaints in pedicab drivers. The correlation coefficient value is 0.441. Where 0.441 is between the values 0.40 – 0.59 which indicates that there is a moderate relationship, meaning that there is a relationship between length of work and the degree of DED with a positive correlation direction, that is, the longer a person works, the higher the degree of DED. This is in accordance with Paudel's research (2018) that the longer a person works in an outdoor environment and is exposed to motor vehicle fumes, the effect on the degree of DED

complaints increases. In Kim's research (2020) it was found that the duration of exposure to air pollution had an effect on the signs and symptoms of DED.

CONCLUSION

Based on the results of research conducted on pedicab drivers in Sumenap, Madura, it can be concluded that there is a relationship with moderate strength between length of work and the degree of DED complaints in pedicab drivers. The distribution of respondents based on length of work, as much as 35% with a length of work of less than 5 years, with a length of work of more than 10 years is 34%, and a length of work of 5-10 years is 34%. The distribution of respondents with normal DED was 60%, severe DED was 17%, moderate DED was 12%, and mild DED was 11%.

REFERENCES

- Badan Pusat Statistik. (2023). Istilah. https://www.bps.go.id/istilah/index.html?Istilah_page=4
- Bjerrum, K.B. (1997). Keratoconjunctivitis sicca and primary Sjogren's syndrome in a Danish population aged 30-60 years. *Acta Ophthalmol Scand.* 75, 281-6
- Dulu, S. T. (2020, June 17). Hampir cetak rekor MURI, Sumenep pernah menjadi kota seribu becak. *STEDU*. <https://sumeneptempodulu.or.id/2021/06/hampir-cetak-rekor-muri-sumenep-pernah-menjadi-kota-seribu-becak/>
- Galperin, G. J., Berra, M., Marquez, M. I., Mandaradoni, M., Tau, J., & Berra, A. (2018). Impact of Environmental Pollution on the Ocular Surface of Sjögren's Syndrome Patients. *Arquivos Brasileiros de Oftalmologia*, 81(6). <https://doi.org/10.5935/0004-2749.20180091>
- Golden, M., Meyer, J., & Patel, B. (2023). *Dry Eye Syndrome*. StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK470411/>
- IQAir. (2023). Kualitas udara di Sumenep. <https://www.iqair.com/id/indonesia/east-java/sumenep>
- Jie, Y., Xu, L., Wu, Y.Y., & Jonas, J.B. (2009). Prevalence of dry eye among adult Chinese in the Beijing Eye Study. *Eye (Lond)*. 23, 688-693
- Kim, Y., Choi, Y. H., Kim, M. K., Paik, H. J., & Kim, D. H. (2020). Different adverse effects of air pollutants on dry eye disease: Ozone, PM2.5, and PM10. *Environmental Pollution*, 265. <https://doi.org/10.1016/j.envpol.2020.115039>
- Kruk, J., Kubasik-Kladna, K., & Aboul-Enein, H.Y. (2015). The role oxidative stress in the pathogenesis of eye diseases: current status and a dual role of physical activity. *Mini Rev Med Chem.* 16, 241-257
- Malet, F., Le, Goff, M., Colin, J., Schweitzer, C., Delyfer, M.N., Korobelnik, J.F., Rougier M.B., Radeau, T., Dartigues, J.F., & Delcourt, C. (2014). Dry eye disease in French elderly subjects: the Alienor Study. *Acta Ophthalmol*, 92(6), 429-36. doi: 10.1111/aos.12174. Epub 2013 Jun 7. PMID: 23742664.

- Mandell, J.T., Idarraga, M., Kumar, N., & Galor, A. (2020). Impact of Air Pollution and Weather on Dry Eye. *J Clin Med*, 9(11), 3740. Doi: 10.3390/jcm9113740. PMID: 33233863; PMCID: PMC7699870.
- Maruyama, K., Yokoi, N., Takamata, A., Kinoshita, S. (2004). Effect of environmental conditions on tear dynamics in soft contact lens wearers. *Investig. Ophthalmol. Vis. Sci*, 45, 2563–2568
- Seen, S., & Tong L. (2018). Dry eye disease and oxidative stress. *Acta Ophthalmol*. 96(4), 412-420. doi: 10.1111/aos.13526. Epub 2017 Aug 21. PMID: 28834388.
- Shah, A.M., & Galor, A. (2021). Impact of Ocular Surface Temperature on Tear Characteristics: Current Insights. *Clin Optom*, 15 (13), 51-62. doi: 10.2147/OPTO.S281601. PMID: 33623465; PMCID: PMC7894805.
- Sridhar, M.S. (2018). Anatomy of cornea and ocular surface. *Indian J. Ophthalmol*. 66, 190–194
- Tarwaka. (2010). *Ergonomi Untuk Keselamatan, Kesehatan, dan Produktivitas*. UNBA Press.
- Uchino, M., & Schaumberg, D.A. (2013). Dry Eye Disease: Impact on Quality of Life and Vision. *Curr Ophthalmol*, 1 (2), 51-57. doi: 10.1007/s40135-013-0009-1. PMID: 23710423; PMCID: PMC3660735.
- Um, S.B., Kim, N.H., Lee, H.K., Song, J.S., & Kim, H.C. (2014). Spatial epidemiology of dry eye disease: Findings from South Korea. *Int. J. Health Geogr*, 13 (31)
- Wang, M.T.M., Craig, J.P. (2019). Natural history of dry eye disease: Perspectives from inter-ethnic comparison studies. *Ocul Surf*, 17(3), 424-433. doi: 10.1016/j.jtos.2019.03.004. Epub 2019 Apr 6. PMID: 30965124.
- Weather Spark. (2023). Iklim dan Cuaca Rata-Rata Sepanjang Tahun di Sumenep. Cedar lake ventures, Inc. <https://id.weatherspark.com/y/126354/Cuaca-Rata-rata-pada-bulan-in-Sumenep-Indonesia-Sepanjang-Tahun#Sections-BestTime>
- Youran, C., Jintao, W., Jiixin, Z., & Wenjin, Z. (2022). Prevalence and Incidence of Dry Eye Disease in Asia: A Systematic Review and Meta-Analysis. *Ophthalmic Res*, 6(65), 647-658. <https://doi.org/10.1159/000525696>