Relationship between Duration of Outdoor Activity, Digital Device Usage and Dry Eye in Primary Pterygium

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Abstract

Purpose: This study aimed to evaluate the relationship between time length of outdoor activity, digital devices usage and dry eye conditions in primary pterygium patients.

Setting/Venue: Thammasat University Hospital, Thailand

Method: This study is a population-based, cross-sectional study at Thammasat University Hospital. Demographic characteristics, time spent on outdoor activity, using digital devices and scores for the Ocular Surface Disease Index (OSDI) were collected. The quantitative data was analyzed to determine the mean and relationships by using statistical tools of ANOVA, simple linear regression, and Pearson correlation.

Results: 314 primary pterygium patients were included. An average of 3.46 and 3.64 hours were spent on outdoor activities and digital devices per day respectively. There were 294, 237 and 247 patients (93.63, 75.48, and 78.67 percent) which reported a history of outdoor activity, using digital devices and dry eyes respectively. The study revealed that the time length of outdoor activity had influence on pterygium size, but time of digital devices usage had not. The duration of more than 3 hours of outdoor activity and more than 2 hours of digital devices usage per day were significantly associated with worsening OSDI scores. The relationship between the duration of outdoor activity, digital device usage and the eye pain (R^2 = 0.013 and 0.026) and the OSDI scores (R^2 = 0.012 and 0.011) were found to be related in the same way.

Conclusion: Primary pterygium patients with a history of outdoor activity and digital devices usage with the duration of more than 3 and 2 hours per day respectively were significantly associated with OSDI scores.

Keywords: Time length, outdoor activity, digital device usage, dry eye, pterygium

EyeSEA 2022;17(2):45-52

DOI: https://doi.org/10.36281/2022020206

Introduction

Pterygium, one of the most common eye diseases, is a fleshy, wing-shaped growth from the conjunctiva, crossing over the limbus onto the cornea.[1] Astigmatism, cosmetic concerns, chronic irritation, and decreased vision due to obscure cornea are important points associated with this disease. Prevalence ranges widely across the world and is most common in the equator area. The cause of a pterygium is still unclear. However, hereditary factors have been postulated as a possible cause, and pterygium growth has a higher prevalence in areas exposed to greater ultraviolet radiation. Long-term exposure to ultraviolet light from the sun is the most important risk factor for pterygium;[2-7] as pterygium is an abnormal conjunctival tissue with impact on symptoms on the ocular surface. Many studies show correlation between pterygium and dry eye disease.[8-9]

According to a summary report from the Dry Eye Workshop (DEWS II), dry eye disease is most common problem of eye health. Results of quality-of-life studies have shown that the impact of moderate to severe dry eye was comparable to that of moderate to severe angina. Dry eye disease has been defined as a disease of the ocular

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Received : September 12, 2022
Accepted : December 16, 2022
Published : December 30, 2022

surface which was caused by a lot of pathogenic origins. The disease disrupted homeostasis of tear film which appears in conjunction with ocular symptoms associated with the tear film instability, inflammation of the eye surface, and loss of sensory perception of the eyes.[9-10] As population surveys, electronic tools were a factor that cause eye disorders among office workers, particularly dry eye symptoms.[11] The prevalence of these disorders was found in more than 50 percent of digital usage users.[12]

As Thailand reported regarding the prevalence of dry eye disease around Bangkok, 34 percent of patients who had an abnormal ocular surface were found to have the dry eye condition, more than half of these patients also had pterygium. In another study at Pathum Thani showed more than 70-85 percent of pterygium patients have dry eye symptoms.[13-15] The researcher intended to study the relationship between time length of outdoor activity, digital device usage and dry eye conditions for reporting new data which will be benefit to pterygium and dry eye disease treatment.

Materials and Methods

This study is a population-based, cross-sectional study at Thammasat University Hospital and collected the data from Pterygium Screening Project at Thammasat Hospital. The inclusion criteria is primary pterygium aged between 15-80 years and the exclusion criteria is patients who were not mentally capable.

Data collection included the following information; age, gender, education, occupation, time length of outdoor activity, time spent on using digital devices (average of hours/days) by patient subjective data. Severity levels of symptoms and signs on the ocular surface such as eye pain, eye irritation, teary eye, blurred vision, red eye, level of disturbances in daily life were collected as visual analog scale (1-10 points). Evaluation of dry eye symptoms was recorded by ocular surface disease index (ODSI).[16] All of the patients were examined by slit lamp for evaluating severity of pterygium and dry eye disease. Horizontal size (measured by slit lamp), type of pterygium and severity of dry eye were also collected. The quantitative data was displayed as numbers which were subsequently analyzed to obtain percentages and mean by using ANOVA and Regression analysis (for correlation analysis, Pearson correlation coefficient was used). The results were considered statistically significant at $P \leq .05$. Statistical analysis was performed using the SPSS software version 22.0 (SPSS Inc, Chicago, IL)

The data was reviewed from the questionnaire that was collected at Thammasat University Hospital. The questionnaire was tested by a simple content validity method by two ophthalmologists who are specialized in cornea and glaucoma. The questionnaire was also verified for linguistic accuracy.[17-18] This research has been approved by the Research Ethics committee 1, the Faculty of Medicine, Thammasat University.

Results

A total of 800 individuals participated in The Pterygium Screening Project at Thammasat Hospital and joined in the questionnaire. Of all the patients, 314 patients had primary pterygium, range of age 15-80 years, the majority age group was 51-60 years of age which was represented by 99 patients (35.1 percent) followed by 41-50 years of age whose 71 patients (22.6 percent) whereas those who were 70 years of age or older were 14 patients (4.5 percent). The average age was 51.2 years. Male participants were more prevalent, 209 patients (66.6 percent). 98 patients (31.2 percent) *were educated at the primary school level*. General labor were the most represented group with 93 patients (29.6 percent) (Table 1).

Table 1: Demographic data of primary pterygium patients (n = 314)

Characteristics	N (%)
Age (years)	
< 30	16 (5.1)
30-40	53 (16.9)
41-50	71 (22.6)
51-60	99 (35.1)
61-70	61 (19.4)
> 70	14 (4.5)
Mean age	51.21
Gender	
Female	105 (33.4)
Male	209 (66.6)
Education	
Uneducated	36 (11.5)
Primary education graduates	98 (31.2)
High school graduates	72 (22.9)
Bachelor's degree graduates	75 (23.9)
Vocational education graduates	33 (10.5)
Occupation	
Unemployed	76 (24.2)
General labor	93 (29.6)
Officer	28 (8.9)
Farmer	41 (13.1)
Officialdom	27 (8.6)
private business owners	13 (4.1)
Merchant	36 (11.5)

The average horizontal size of pteryguim was 2.68 millimeters. The number of patients who's size of pterygium was less than 1.5 millimeters were 65 patients (20.7 percent), 1.5-4.0 millimeters were 215 patients (68.5 percent) and more than 4.0 millimeters were 34 patients (10.8 percent). The average duration of outdoors activity (hours/days) was 3.46 hours/day, the duration of digital device usage was 3.64 hours/day. In all patients with pterygium, 294 (93.6 percent) reported the history of outdoors activity and 237 (75.4 percent) reported the history of using the digital devices. (Table 2) The severity of the OSDI scores were observed when symptoms started to appear which was found in 247 patients (78.7 percent). Moderate level symptoms were found in 107 patients (34.1 percent). (Table 3 and Figure 1) Five symptoms of the ocular surface consisting of the visual analog scale (1-10 points), for eye irritated, blurred vision and eye redness were the highest at 5.83 points, followed by that of eye tearing, eye pain at 4.50, and 3.83 points respectively. (Table 4)

Table 2: Pterygium clinical data of primary pterygium patients (n = 314)

Characteristics The Time spent outdoors activity (hours / days)	N (%)
Mean	3.46
< 1	20 (6.4)
1	31 (9.9)
2	50 (15.9)
3	41 (13.1)
4	42 (13.4)
5	25 (8.0)
6	40 (12.7)
7	6 (19.9)
8	34 (10.8)
> 8	25 (8.0)
The time spent on using digital devices (hours / days)	
Mean	3.64
< 1	77 (24.5)
1	32 (10.2)
2	43 (13.7)
3	29 (9.2)
4	32 (10.2)
5	18 (5.7)
6	22 (7.0)
7	6 (1.9)
8	24 (7.6)
> 8	31(9.9)

Table 3: The Ocular Surface Disease

Index (OSDI) level	N (%)
No symptoms (0 -12)	67 (21.3)
Mild (13-22)	98 (31.2)
Moderate (23-32)	107 (34.1)
Severe (≥ 33)	42 (13.4)

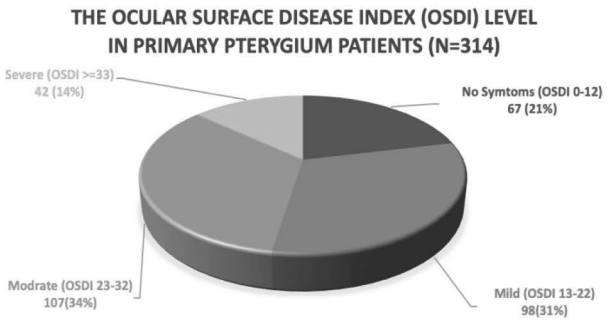

Figure 1: The Ocular Surface Disease Index (OSDI) level

Table 4: Scores of symptoms and signs on ocular surface as per the Visual analog scale (VAS)

Visual analog scale (VAS)	Mean scores	% Concern
Total scores (C) (60)	31.9	
Eye pain (10)	3.8	22.9
Eye irritated (10)	5.6	15.3
Eye tearing (10)	4.5	21.3
Blurred vision (10)	5.6	14.6
Eye redness (10)	5.6	14.0
Disturb daily life (10)	6.4	19.1

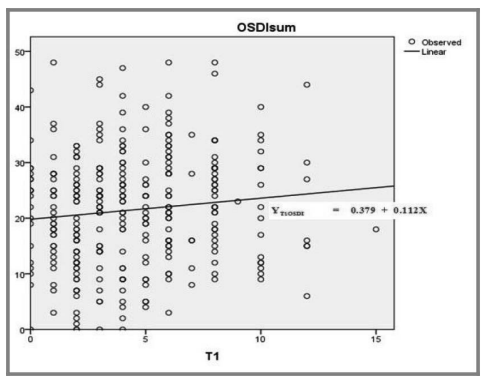

Figure 2 and 3: The relationship between the time length of outdoor activity (T1) Time length of digital devices usage (T2) and the severity of OSDI scores

Table 5: The relationship between time length of outdoor activity, digital devices usage, and dry eye conditions in pterygium patients

Data	The Ocular Surface Disease Index (OSDI) scores		Scores of symptoms and signs on ocular surface (Visual analog scale: VAS)					
	(*P* value[1])	(*P* value[2])	Eye pain (*P* value[2])	Eye irritated (*P* value[2])	Eye tearing (*P* value[2])	Blurred vision (*P* value[2])	Eye redness (*P* value[2])	Disturb daily life (*P* value[2])
Time length of outdoor activity (hours/days)		.034* (**R**^{2}.012)	.05* (**R**^{2}.013)	.427	.185	.141	.240	.181
≤ 2, > 2	.747							
≤ 3, > 3	.004*							
≤ 4, > 4	.018*							
≤ 5, > 5	.032*							
Time length of digital devices usage (hours/days)		.041* (**R**^{2}.011)	.003* (**R**^{2}.026)	.178	.741	.031	.112	.320
≤ 2, > 2	.044*							
≤ 3, > 3	.038*							
≤ 4, > 4	.031*							
≤ 5, > 5	.030*							

[1] Analyzed to obtain percentages and mean by using ANOVA
[2] Regression analysis (for correlation analysis, Pearson correlation coefficient was used)

Pearson correlation coefficients and simple linear regression were used to ascertain the relationship between the time length of outdoor activity and time length of digital devices usage and the severity of OSDI scores as shown in figures 2 and 3. The study revealed that an increased duration of outdoor activity and digital device usage was associated with increased OSDI scores, *P* value = .034, R^2 = 0.012 and *P* value = .041, R^2 = 0.011 respectively. (Table5)

In terms of duration of outdoor activity, the differences between groups with durations of less than 3 hours per day and more than 3 hours per day were significantly associated with OSDI scores. With regards to duration of digital device usage, groups with durations of less than or equal 2 hours per day and more than 2 hours per day were significantly associated with OSDI scores. With regards to the relationship between duration of outdoor activity, digital device usage and scores of symptoms and signs on ocular surface as visual analog scale (VAS), the results of this study suggested that eye pain was a significant factor, *P* value 005 and R^2 0.013 along with duration of outdoor activity *P* value .003 and R^2 and duration of digital device usage. (Table 5)

Discussion

The Thammasat Hospital Pterygium Screening Project provided general population with an opportunity to attend screening for pterygium. All patients had primary pterygium, 294 of the population or 93.6 percent reported a history of significant outdoor activity. According to the previous studies, pterygium growth has a higher prevalence in areas exposed to greater ultraviolet radiation and long-term exposure to ultraviolet light from the sun is the most important risk factor for pterygium.[2-7,18]

Many studies suggest a correlation between pterygium and dry eye disease.[8-9,18] In this study defined the history of outdoors activity as exposed ultraviolet light or sun exposure. Our data suggested that more than 90 percent of patients reported a history of significant outdoors activity. This study provided a new perspective on known risk factors of outdoor activities and device usage by examining the dimension of

time, which to our knowledge, no previous studies have been conducted in this way. We have found that the duration of more or less than three hours marks the significant threshold for outdoor activities in affecting OSDI scores. In the digital devices usage group, all patients had pterygium, 237 patients or 75.4 percent reported a history of using the digital devices. According to the previous studies concerning office workers, the prevalence of the device usage was reported at only 60 percent. Thus, the discovery in this report is relatively high compared to the general population.[11]

The average outdoor activity duration was 3.46 hours, which was shorter than the number of hours spent on digital devices usage which reported 3.64 hours. Of all patients with primary pterygium, more than 90 percent reported a history of outdoor activities, while only 75.4 percent of patients reported using digital devices. In this study, the average duration of digital device usage is greater than that of outdoor activity, contrary to current lifestyle trends.

The results of this study revealed that the duration of outdoor activity, digital device usage, severity of eye pain and level of disturbance in daily life concordantly influenced each other. In previous studies regarding the general population who use digital devices regularly, approximately 50 percent of the eye abnormalities associated with abnormal vision and eye pain were reported.[19] The result was conducted in reference to primary pterygium patients and the obtained results suggested that patients who spent more time on digital devices experienced eye disorders, like the results found in general population.

On the other hand, with regards to the relationship between the duration of outdoor activity and digital devices usage and the OSDI scores, the results indicated that these factors concordantly influenced each other. In patients with primary pterygium, the time length of outdoor activity, time length of digital devices usage influenced severity of the OSDI scores, an index that signified the dry eye syndrome. According to previous studies in the general population, the results suggested that the time length of outdoor activity and time length of digital devices usage affected dry eye conditions.[13-15,17]

There are limitations associated with this research which collected data from patients undertaking subjective questionnaires who may have data collection bias. Although this study was population-based and cross-sectional which collected a large population sample, the simple sampling method was used which may have selection bias. Although there are some limitations in this study, the obtained information may be beneficial for future research.

Conclusion

Primary pterygium patients were found to have the history of outdoor activity and digital devices usage (93.63 and 75.48 percent). Furthermore, the duration of outdoor activity and digital device usage of more than 3 and 2 hours per day respectively were significantly associated with OSDI scores. The duration of outdoor activity, digital device usage, eye pain, and the severity level of the OSDI scores were also found to be significantly correlated.

What is already known on this topic?

According to previous studies in the general population of a foreign country, the results suggested that outdoor activity and digital devices usage affected dry eye conditions. Thai population, particularly the patients with pterygium, data was limited.

What does this study add?

To report the relationship between duration of outdoor activity, digital device usage and dry eye in primary pterygium.

Acknowledgement

We would like to acknowledge Associate Professor Sakchai Vongkittirux, Associated Professor Kosol Kampitak and Sutee Ananprasert who created Thammasat University Hospital's Pterygium Screening Project.

Funding

No

Potential conflicts of interest

The authors declare no conflict of interest.

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Printed at: Thammasat Printing House, 2022
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