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Characteristic of Pterygium Among Merchants in Tanah Lot Coastal Tourism Area, Bali

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ABSTRACT

Introduction: The high incidence of pterygium in Indonesia, especially in Bali, can decrease the quality of life due to impaired vision or blindness related to visual axis disruption. Pterygium is characterized by fibrovascular tissue growth extending from the nasal area or temporal limbus towards the cornea. Exposure to UV rays and activities in dusty or sandy areas are contributing factors to the increased incidence of pterygium. The Tanah Lot Tourist Attraction Area is a coastal tourism site where the majority of the local community engages in trading activities. This research aims to investigate the characteristics of Pterygium among traders in the Tanah Lot Tourist Attraction Area
Methods: It was an observational-descriptive study with a cross-sectional design. The sample consisted of 100 respondents selected through consecutive sampling based on inclusion criteria. Data were obtained through questionnaire-based interviews and documented using a digital camera. The collected data will be descriptively analyzed using SPSS version 25.0, employing univariate analysis and cross-tabulation to observe the characteristics of pterygium based on age, gender, exposure history, and duration of exposure.
Results: The research findings reveal that the majority of pterygium patients are aged between 46 and 55, female, have a history of sun exposure for more than 10 years, and spend more than 4 hours outdoors. Most subjects in the study have grade 2 pterygium, which indicates growth beyond the corneal limbus but not exceeding 2 mm onto the cornea.
Conclusion: This study provides further insight into the characteristics of pterygium patients, aiming to raise awareness about the continuous hazards of UV exposure.

Keywords: UV light; Characteristics; Pterygium, Merchant

INTRODUCTION

One cause of visual disturbances and decreased visual acuity is pterygium. Pterygium is a growth of fibrovascular connective tissue that passes through the nasal part or temporal limbus until it approaches the cornea. It can lead to diminished visual function or blindness due to its association with disruptions in the visual axis, specifically affecting the cornea[1] .

The high incidence of pterygium occurs mainly in areas near the equator caused by higher exposure to sunlight[2]. This is evidenced by incidence rates of 2% in the United States, 6.9% in Singapore, and 8.3% in Indonesia. The highest prevalence of pterygium has been recorded in Bali at 25.2%, followed by Maluku at 18.3% and West Nusa Tenggara at 17.0% [3]. The high prevalence of pterygium in Indonesia can be explained by Indonesia's location near the equator and having a tropical climate. Therefore, the risk of developing pterygium is 44 times higher compared to areas with non-

tropical climates[4]. The high incidence of pterygium in tropical climates is primarily attributed to ultraviolet (UV) radiation. UV rays are believed to contribute to the occurrence of pterygium by approximately 40%[5]. Pterygium is also a disease that is more common in coastal areas. Based on Basic Health Research in 2018, in Bali Province, there were three areas with the highest prevalence of pterygium cases. They are Tabanan (44.4%), Jembrana (40.5%), and Klungkung (37.0%)[7]. Apart from the influence of sun exposure, high activity in windy, dusty or sandy environments is also a risk factor for pterygium[8].

Agrasidi and Triningrat (2018) conducted research on the characteristics of pterygium based on occupational categories, specifically among indoor workers, outdoor workers, and those who work both indoors and outdoors. Their study revealed that 14.3% of pterygium cases occurred in individuals who worked in both indoor and outdoor environments, with merchants being included in this group[4].

Length of exposure or duration of working outdoor is a risk factor for pterygium. This statement is supported by research conducted by Agrasidi & Triningrat (2018) in Tianyar Village, Karangasem, Bali. It was found that the highest number of pterygium sufferers were those with a duration of ≥ 4 hours, amounting to 64.3%, while sufferers with exposure duration < 4 hours were 35.7%, this is in accordance with the risk factors for pterygium associated with exposure to UV light. The etiology and causes of pterygium are multifactorial, including duration of sun exposure and type of work[4]. That conditions are related with the characteristics of the merhants in the Tanah Lot Coastal Tourism Area (DTW) and their susceptibility to pterygium. The coastal environment and outdoor occupational setting of merchants in Tanah Lot expose them to prolonged ultraviolet radiation, making them a high-risk group for developing pterygium[6].

Considering this background, the researchers aim to investigate the characteristics of pterygium among merchants in the Tanah Lot Coastal Tourism Area. Tanah Lot was selected as the study location because it lies in Tabanan Regency, which reports the highest prevalence of pterygium in Bali Province. Moreover, Tanah Lot is a popular coastal tourist destination where merchants are continuously exposed to outdoor environmental risk factors, particularly ultraviolet radiation. Unlike previous studies that have generally focused on the general population or farmers, this study specifically describes a high-risk occupational group in a tourism-driven coastal area. The findings are expected to provide baseline data that may support further research and awareness efforts regarding occupational eye health in similar settings.

METHOD

This study employs a non-experimental approach characterized by descriptive research design, specifically adopting a cross-sectional methodology. Primary data were collected through interviews and clinical examinations conducted among merchants afflicted with pterygium in the DTW Tanah Lot area. The study duration spanned six months, from July to December 2023. The target population comprised merchants operating within the Tanah Lot area, adhering to predefined inclusion criteria. Sample size estimation utilized the cross-sectional descriptive formula, considering the unknown population size at the research site. Accordingly, the minimum required sample size was calculated to be 96 respondents, rounded up to a final sample size of 100 respondents.

The variables examined in this study included age, gender, exposure history (in years), duration of exposure per day (in hours), and degree of pterygium. Data collection was carried out with guidance from the ophthalmology department supervisor, starting with providing informed consent and then filling in the questionnaire through interviews and documentation using a digital camera. Pterygium diagnosis and grading were confirmed by a certified ophthalmologist using standard examination. Then, the data obtained through this research was analyzed descriptively using SPSS with univariate analysis

techniques. The data was then described based on each variable's frequency distribution and percentage and interpreted based on the results obtained.

This research has obtained approval from the Health Research Ethics Committee of the Denpasar Health Polytechnic under reference number DP.04.02/F.XXXII.25/0708/2023.

RESULT

Characteristics of Participants

We examined 100 merchants in DTW Tanah Lot who fulfilled eligibility criteria, with the characteristic shown in Table 1.

Table 1. Characteristics of Participants

Variable	Frequency (n=100)	Percentage (%)
Age		
17 – 25 years old	1	1.0
26 – 35 years old	6	6.0
36 – 45 years old	18	18.0
46 – 55 years old	46	46.0
56 – 65 years old	24	24.0
> 65 years old	5	5.0
Gender		
Female	63	63.0
Male	37	37.0
History of Exposure		
5 – 10 years	24	24.0
> 10 years	76	76.0
Duration of Exposure per Day		
≤ 4 hours	0	0
> 4 hours	100	100

Grade of Pterygium

Pterygium have been classified into 4 grades, as follows: pterygium only on corneal limbus (grade 1), pterygium extends beyond the limbus on the cornea but does not exceed 2 mm (grade 2), pterygium exceeds grade 2 but does not exceed the edge of the pupil in normal light (grade 3), and the most severe is grade 4, which is pterygium extends beyond the pupil of the eye until disrupting the vision[9]. From 100 participants who joined this research, we found 40 participants were at grade 1, 45 participants had grade 2, 14 participants were at grade 3, and only 1 participant had grade 4, as shown in table 2.

Table 2. Grade of Pterygium

Pterygium Grade	Frequency (n=100)	Percentage (%)
Grade 1	40	40.0
Grade 2	45	45.0
Grade 3	14	14.0
Grade 4	1	1.0

In this study, a cross-tabulation was carried out between participant characteristics and the grade of pterygium with the aim of analyzing the causes of pterygium severity in participants. The finding as revealed in table 3, show that the severity of pterygium increases with age. Younger

participants tend to experience pterygium to a milder grade. Severe pterygium (grade 3 and 4) was dominated by participants aged 46 years old, history of exposure > 10 years, and duration of exposure per day >4 hours. This research succeeded in finding 1 participant with pterygium grade 4, with characteristic as follows: age 56-65 years old, male, had a history of exposure >10 years, and duration of exposure >4 hours.

Table 3. Cross-tabulation Between Participants Characteristics and The Grade of Pterygium

Variable	Grade of Pterygium				Total
	Grade 1	Grade 2	Grade 3	Grade 4	
Age (years old)					
17 – 25	1	0	0	0	1
26 – 35	4	2	0	0	6
36 – 45	10	7	1	0	18
46 – 55	17	21	8	0	46
56 – 65	8	11	4	1	24
> 65	0	4	1	0	5
Total	40	45	14	1	100
Gender					
Female	30	26	7	0	63
Male	10	19	7	1	37
Total	40	45	14	1	100
History of Exposure					
5 – 10 years	15	7	2	0	24
> 10 years	25	38	12	1	76
Total	40	45	14	1	100
Duration of Exposure per day					
≤ 4 hours	0	0	0	0	0
> 4 hours	40	45	14	1	100
Total	40	45	14	1	100

DISCUSSION

Characteristics of Participants

Pterygium is known to affect individuals across all age cohorts; however, its propensity to manifest in adults is notably elevated. The research findings revealed that a predominant portion of respondents within the 46 – 55 years old exhibited pterygium, comprising 46% of the total respondents. This predilection can be attributed to the heightened susceptibility of the conjunctiva to pterygium development upon exposure to ultraviolet (UV) radiation or airborne particulate matter, such as dust[10]. Some literature also states that the prevalence of pterygium tends to increase with age. This is related to the pathogenesis theory of accumulated UV sun exposure, as well as disturbance and thinning of the stem cell limbus, which generally occurs at an increasing age[1,5].

The research findings indicated a predominance of female respondents, comprising 63 individuals (63%), while male respondents totaled 37 individuals (37%). Consistent with various prior investigations, gender distinctions did not yield significant disparities in pterygium prevalence. For instance, previous cross-sectional study from Djelantik et al (2016) similarly failed to ascertain significant associations between gender and pterygium incidence, as evidenced by a non-significant p-value of 0.964[5]. Research by Praharsiwi (2017) found that the incidence of pterygium was greater in women compared to men[11]. However, according to research by Agrasidi & Triningrat (2018), pterygium sufferers were higher in men at 54.8%, while in women, it was 42.5%[4]. Differences in study results can occur depending on the lifestyle of each individual[12].

Differences in gender proportions in research can be caused by differences in sample collection methods and characteristics of respondents at research locations. The results of the research are that pterygium occurs more frequently in women, possibly because the majority of merchants in the DTW Tanah lot area are women. However, there is research that discusses hormones in women related to ocular surface cytology, as known with estrogen. The hormone estrogen can cause a decrease in lipid production and the size of the meibomian glands, which is related to dry eye symptoms so that there can be an increase in risk factors for damage to the conjunctival layer. Apart from that, there is also a derivative of the estrogen hormone, namely 17β-estradiol, which can increase the expression of pro-inflammatory cytokines and *matrix metalloproteinase* (MMP) in corneal epithelial cells[13]. In the context of pterygium pathogenesis, Matrix Metalloproteinases (MMPs) play multifaceted roles in inflammation, fibrogenesis, vascularization, and invasion processes. Consequently, this study posits a plausible correlation between female hormonal factors and heightened pterygium incidence, owing to the intricate involvement of MMPs in these biological mechanisms[14].

The majority of respondents afflicted with pterygium in this study reported a history of sunlight exposure exceeding 10 years, accounting for 76% of cases, whereas 24% reported exposure durations ranging from 5 to 10 years. In congruence with Hanifah et al.'s (2018) investigation, correlation analyses revealed significant associations between a decade or more of sun exposure and pterygium incidence (p-value = 0.018). Conversely, no statistically significant relationship was discerned between a 5-year exposure history and pterygium occurrence in this study (p-value = 0.072)[2].

The cause of pterygium is known to be multifactorial. The high number of pterygium with a history of exposure > 10 years is closely related to accumulated exposure to UV light. This pattern aligns with a recognized risk factor for pterygium, namely, recurrent exposure to ultraviolet (UV) radiation[4]. Based on the pathogenesis of pterygium, exposure to UV light can initiate the formation of pterygium tissue, which will cause an increase in the number of stem cell limbus to form pterygium[15]. So, in an effort to minimize the incidence of pterygium in the community, it is best to protect against sunlight to reduce the prevalence of pterygium[16].

All respondents in this study experienced daily sun exposure exceeding four hours, with 100% suffering from pterygium. In Agrasidi and Triningrat's (2018) study, the sample population engaged in outdoor activities, with 64.3% reporting an exposure duration of four hours or more, while 35.7% reported exposure durations of less than four hours[4]. Pterygium exhibits a correlation with the duration of outdoor activities, aligning with one of its recognized risk factors: frequent exposure to ultraviolet (UV) radiation. This association certainly underscores the significance of mitigating UV exposure in the prevention of pterygium[4,17]. Research by Delima & Amanda (2014) stated that outdoor activities and constant exposure to sunlight have a 2-9 times risk of suffering from pterygium. This study explained that someone who works outdoors for more than 5 hours without any protection is at risk of exposure to high-intensity sunlight, which causes changes in cellular components, especially fibroblast elastase activity, which triggers the development of fibroblasts. This activity is triggered by high levels of radiation from UV rays[18].

Grade of Pterygium

The highest degree of severity of pterygium in this study was grade 2 at 45% or 45 respondents, then grade 1 at 40%, grade 3 at 14% and grade 4 at 1%. Similar results were also obtained in research by Agrasidi & Triningrat (2018) with the characteristics of participants with pterygium in Tianyar Karangasem village, Bali are 45.9% of grade 2 pterygium, 43.2% of grade 1, 6.8% of grade 3, and 6.8% of grade 3. 4 at 4.0%[4]. However, different results were obtained in Hanifah's (2018) research conducted at a special eye hospital in the province of South Sumatra, namely that the highest number of pterygium incidents was grade 4 pterygium at 39.7%, grade 3 pterygium at 31%, and grade 2 pterygium and grade 1 respectively amounting to 25.9% and 3.4%. These results may be attributed to the tendency of patients

with pterygium to seek medical attention only when the condition significantly impairs their daily activities[2].

In this study, as in Table 3, it can be seen that the degree of pterygium increases with age. Younger patients tend to experience pterygium to a milder degree. Pterygium with more severe degrees (grades 3 and 4) was dominated by research subjects aged 46 years and over, with exposure history > 10 years and exposure duration > 4 hours. Factors influencing the severity of pterygium include age, which correlates with cumulative sun exposure over time[12]. Exposure history and duration of exposure are also factors that can influence the severity of pterygium[19]. Some literature states that gender is not a factor that influences the severity of pterygium or the increase in the incidence of pterygium. Pterygium can occur in both men and women. The increase in incidence in men and women is closely related to the activities carried out and the duration of exposure to sunlight[5,19].

Research Limitations

Measurement error or bias in determining the degree of pterygium in this study is a potential concern; however, it is mitigated by restricting the operational definition of variables, thoroughly documenting ocular conditions, and receiving guidance from an expert supervisor in the field of ophthalmology. Nonetheless, researchers cannot control the subjects' activities prior to measurement, such as the use of personal protective equipment like sunglasses or hats, which may influence the results.

CONCLUSION

The results of this study showed that the majority of pterygium sufferers were female, aged 46-55 years old, had a history of sun exposure for > 10 years, and had been outdoors for > 4 hours. Most of the research subjects had grade 2 pterygium, which is the growth of pterygium has extended beyond the limbus of the cornea but not exceeding 2 mm. This research contributes to a deeper understanding of the characteristics of pterygium sufferers, thereby enhancing awareness of the risks associated with prolonged UV exposure.

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