



doi: 10.12419/ykxb24062409

View this article at: <https://dx.doi.org/10.12419/ykxb24062409>

• Original Article •

## Characterization of epidemiological and clinical features of pterygium in a multiethnic region in Yunnan Province

Yun Xie (谢芸)<sup>1</sup>, Wending Li (李文定)<sup>1</sup>, Chunguang Li (李春光)<sup>1</sup>, Hongyang Zhao (赵红杨)<sup>1</sup>,  
Guifei Zhang (张贵妃)<sup>1</sup>, Liqin Hong (洪丽琴)<sup>1</sup>, Yimin Zhong (钟毅敏)<sup>2</sup>, Chunxiao Wang (王春筱)<sup>2</sup>

1. The People's Hospital of Fengqing, Lincang 675999, China.

2. State Key Laboratory of Ophthalmology, Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangdong Provincial Key Laboratory of Ophthalmology and Visual Science, Guangdong Provincial Clinical Research Center for Ocular Diseases, Guangzhou 510060, China.

### HIGHLIGHTS

- This study identified distinct epidemiological characteristics of pterygium in Fengqing, featuring a pronounced female predominance (female-to-male ratio of 6.67:1,  $P < 0.001$ ), a concentration of the majority of patients in the 46–55 age group (36.71%), and a relatively low recurrence rate (1.71%).
- Data of inpatients with pterygium in 2023 were retrieved from medical records via the hospital information system. Statistical analyses included the chi-square test and multivariate logistic regression.
- Fengqing County is a key area for Sun Yat-sen University's poverty alleviation initiatives. This study presents epidemiological findings on pterygium—a high-prevalence ocular disorder—thereby providing evidence-based insights for formulating targeted medical assistance strategies in ethnic minority regions.

**Abstract:** **Objective:** Fengqing County, situated in Yunnan Province, is a high-altitude region known for its ethnic diversity and a notably high prevalence of pterygium. As a key area for Sun Yat-sen University's poverty alleviation initiatives, this study aims to investigate the unique characteristics of pterygium in specific region. **Methods:** We analyzed data from hospitalized patients admitted to the Ophthalmology department of the People's Hospital of Fengqing in 2023. The data were extracted from medical records through the hospital information system. The chi-square test was used for

Received date: 2024-06-24; Revised date: 2025-03-01; Accepted date: 2025-03-19; Published online: 2025-06-25

Corresponding authors: Chunxiao Wang, Email: [wangchx29@mail.sysu.edu.cn](mailto:wangchx29@mail.sysu.edu.cn).



Full Text

statistical comparison, and multivariate logistic regression analysis was conducted to explore the factors influencing the onset of pterygium. A significance level of  $P < 0.005$  was set. **Results:** In 2023, out of 1137 ophthalmic inpatients, 207 (18.2%) underwent pterygium surgery. There was a significant female predominance, with a female-to-male ratio of 6.67:1 ( $P < 0.001$ ). However, no significant ethnic variation was observed ( $P = 0.57$ ). The majority of patients were in the 46-55 age group (36.71%), and the recurrence rate was low at 1.71%. Female gender, increasing age, diabetes mellitus, age-related cataract, and meibomian gland dysfunction were identified as independent risk factors for pterygium in this region. **Conclusion:** Fengqing is likely to have intricate connections between the occurrence and treatment of pterygium and its local geography, culture, and socio-economic conditions. Medical assistance programs should take these factors into account and prioritize them in poverty alleviation initiatives.

**Keywords:** pterygium; female; multi-ethnic; medical assistance

**Cite this article as:** Xie Y, Li WD, Li CG, Zhao HY, Zhang GF, Hong LQ, Zhong YM, Wang CX. Characterization of epidemiological and clinical features of pterygium in a multiethnic region in Yunnan Province. *Eye Science*, 2025, 2(2): 202-210. doi: 10.12419/ykxb24062409.

Pterygium is a common ocular surface disorder that has both cosmetic and functional consequences. If left untreated, it can result in progressive visual impairment. Epidemiological studies have demonstrated significant geographical variation in its prevalence, with notably higher rates observed in high-altitude regions (ranging from 12.3% to 39.0%) compared to low-altitude areas (ranging from 4.43% to 9.4%).<sup>[1-9]</sup>

Yunnan Province is located in the southwestern plateau region of China, with an average altitude of over 2,000 meters. Epidemiological data show that the prevalence of pterygium among middle-aged and elderly populations in this area can be as high as 35.2% to 39%.<sup>[3-4]</sup> Fengqing County, situated in the southwest of Yunnan and near China's border, is home to 23 ethnic groups, including Han, Yi, Bai, Miao, and other minorities.<sup>[10]</sup> Since 2013, Sun Yat-sen University has been designated as the main institution responsible for targeted medical poverty alleviation in Fengqing County. Understanding the epidemiology of high-prevalence ocular disorders such as pterygium is crucial for improving the effectiveness of medical assistance programs in ethnic minority areas. The present study aims to investigate the epidemiological and clinical characteristics of pterygium, thus providing evidence-based insights for the formulation of targeted medical assistance strategies.

## METHOD

### General information

This study conducted a retrospective analysis of the hospitalized patients in the Ophthalmology department of The People's Hospital of Fengqing during the period from January to December 2023. The inclusion criteria were as follows: (1) patients whose primary diagnosis was pterygium and for whom the main purpose of hospitalization was pterygium excision; (2) patients with the proliferated pterygium tissue encroaching upon the limbus and presenting with significant ocular symptoms; (3) patients with complete epidemiological and clinical data. Meanwhile, patients with malignant tumors, as well as those suffering from severe heart, liver, lung, kidney diseases and autoimmune disorders, were excluded from the study.

### Diagnostic criteria and surgical indications

Pterygium is defined as the abnormal proliferation of conjunctival tissue within the palpebral fissure, which progressively encroaches across the limbus onto the corneal surface. This fibrovascular proliferation typically takes on a triangular shape, with its apex directed toward the cornea. The severity of pterygium was classified using a five-grade system.<sup>[11]</sup> Grade 0: No conjunctival tissue proliferation in the palpebral fissure; Grade 1:

The pterygium head reaches the limbus and minimally disrupts the corneal marginal arc (Vogt's palisade); Grade 2: The pterygium head invades the area between the limbus and the pupillary margin; Grade 3: The pterygium head encroaches upon the pupillary region; Grade 4: The pterygium head extends beyond the pupil to the contralateral corneal margin. Surgical intervention was indicated for grades 1–4. Analysis was conducted using photographs captured by an anterior segment photography system (Chongqing Kanghua Ruining SLM-7E).

## Statistics

Statistical analysis was conducted using SPSS Statistics 26.0 software. Categorical data were presented as percentages (%). Intergroup comparisons were assessed using the chi-square ( $\chi^2$ ) test. Spearman correlation analysis was used to examine the correlations among grading data. A multivariate logistic stepwise regression analysis was carried out to investigate the influencing factors of pterygium onset. A significance level of  $P < 0.05$  was set to determine statistical significance.

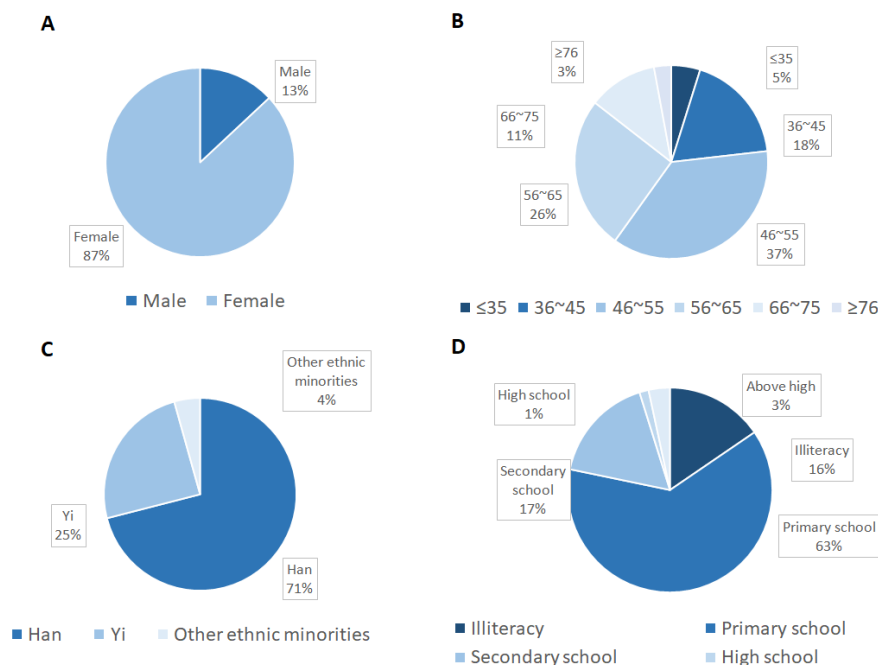
## RESULTS

### General

In 2023, the Ophthalmology department recorded a total of 1,413 hospitalized patients. Among them, 234 individuals were diagnosed with pterygium and underwent pterygium excision surgeries, accounting for 16.56% of the overall patient population. After excluding patients with repeated admissions, the revised total number of patients was 1,137. Among these, 207 patients had pterygium as their primary diagnosis, representing 18.21% of the total. The distribution of demographic characteristics and educational attainment levels is illustrated in Figure 1, and the corresponding numerical data are detailed in Table 1.

### Epidemiological characteristics of pterygium

The analysis revealed significant gender-based differences in pterygium prevalence. Female patients had substantially higher prevalence rates compared to male patients ( $P < 0.001$ ,  $\chi^2 = 89.261$ ). However, no statistically significant ethnic variations were observed among different groups ( $P = 0.57$ ,  $\chi^2 = 1.125$ ). Age distribution



**Figure 1** Demographic characteristics of pterygium surgery patients in 2023

(A) Gender distribution, (B) Age group stratification, (C) Ethnic composition, and (D) Educational attainment levels.

analysis identified a predominant cluster within the 46-55-year age group, which had a significantly larger number of patients compared to both younger (<45 years) and older (>56 years) age groups ( $P < 0.001$ ,  $\chi^2 = 31.732$ ). Regarding educational attainment patterns, 63% of patients had received primary school education, representing a statistically significant majority compared to other education levels ( $P < 0.001$ ,  $\chi^2 = 64.467$ ). Complete statistical distributions are presented in Figure 2.

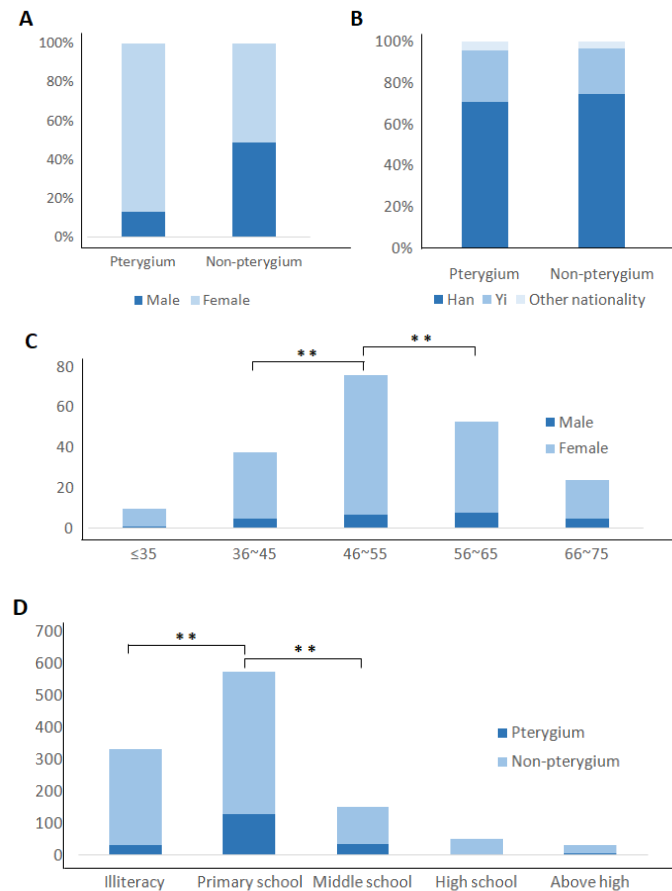
### Clinical characteristics of pterygium

Among the 207 patients, 88 cases (42.51%)

presented with bilateral pterygium, while 119 cases (57.49%) had unilateral involvement. Analysis of 234 affected eyes revealed that the fibrovascular proliferation was predominantly located nasally (232 eyes, 99.15%), with rare occurrences in the temporal region (1 eye, 0.43%) and bilaterally (1 eye, 0.43%). Primary pterygium accounted for the majority of cases (228 eyes, 97.44%), with only 4 eyes (1.71%) showing recurrence. Using the standardized 0-4 Grading system described in the Methods section, the severity distribution among the 234 eyes was as follows: Grade 0, 0 cases; Grade 1, 22 eyes (9.40%); Grade 2, 160 eyes (68.38%); Grade 3, 47 eyes

**Table 1 Demographic and educational level distributions of hospitalized patients in Ophthalmology department of the people's hospital of Fengqing in 2023**

Category	All inpatients		Patients with pterygium		
	Number	Proportion	Number	Proportion	
Gender	Male	482	42.39%	27	13.24%
	Female	655	57.61%	180	86.76%
	Total	1137	100%	207	100%
Age	≤35	84	7.39%	10	4.83%
	36~45	84	7.39%	38	18.36%
	46~55	204	17.94%	76	36.71%
	56~65	301	26.47%	53	25.60%
	66~75	322	28.32%	24	11.59%
	≥76	142	12.49%	6	2.91%
	Total	1137	100%	207	100%
Education level	Illiterate	331	29.11%	32	15.46%
	Primary school	573	50.40%	130	62.80%
	Secondary school	151	13.28%	35	16.91%
	High school and above	82	4.40%	10	1.45%
	Total	1137	100%	207	100%
Ethnic groups	Han	840	73.87%	147	72.06%
	Yi	255	22.43%	51	24.02%
	Other ethnic minorities	42	3.52%	9	4.35%
	Total	1137	100%	207	100%



**Figure 2** Statistical analysis of pterygium prevalence in different gender, ethnic groups, age and educational attainment levels in pterygium patients in 2023

(A) Female patients demonstrated substantially higher rates than male patients ( $p < 0.001$ ,  $\chi^2 = 89.261$ ); (B) No statistically significant ethnic variations were observed across different groups ( $p = 0.57$ ,  $\chi^2 = 1.125$ ); (C) In pterygium patients, cases in the 46-55 year cohort showed a substantially larger number than other age groups ( $p < 0.001$ ,  $\chi^2 = 31.732$ ); (D) For the educational attainment level analysis, 63% of the pterygium patients had primary school education, representing a statistically significant majority compared to other education levels ( $p < 0.001$ ,  $\chi^2 = 64.467$ ).

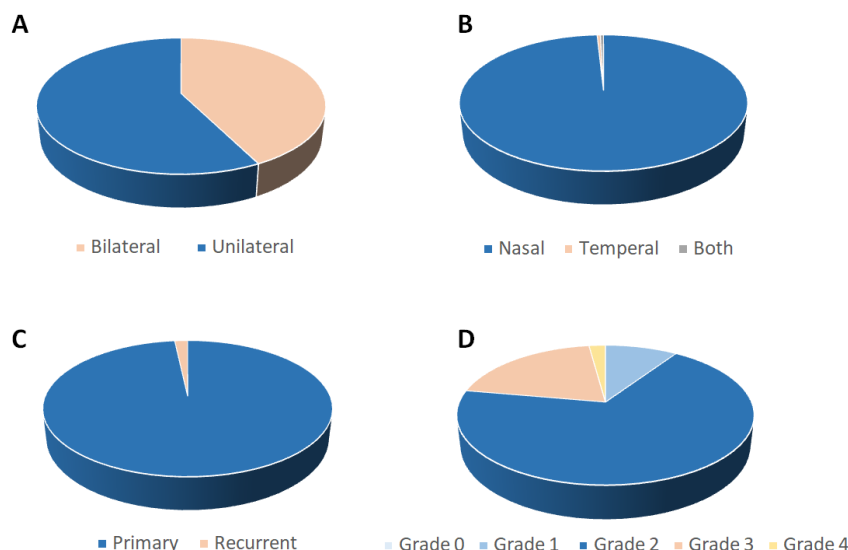
(20.09%); Grade 4, 5 eyes (2.14%) (Figure 3). Notably, female patients exhibited significantly higher pterygium severity compared to male patients ( $\chi^2 = 8.777$ ,  $P = 0.032$ ). In this study, no significant correlation was found between age and the severity of pterygium ( $R = 0.113$ ,  $P = 0.084$ ).

### Analysis of risk factors associated with the development of pterygium

In the Fengqing region, hypertension, diabetes mellitus, meibomian gland dysfunction, age-related cataract, and ametropia are highly prevalent. We conducted a comprehensive analysis to explore the associations between these ocular and systemic diseases and pterygium. The findings revealed that meibomian

gland dysfunction ( $\chi^2 = 312.9$ ,  $P < 0.001$ ), age-related cataract ( $\chi^2 = 72.842$ ,  $P < 0.001$ ), hypertension ( $\chi^2 = 29.792$ ,  $P < 0.001$ ), and diabetes mellitus ( $\chi^2 = 14.859$ ,  $P < 0.001$ ) were significantly correlated with the occurrence of pterygium. In contrast, ametropia demonstrated no such significant relationship ( $\chi^2 = 0.440$ ,  $P = 0.507$ ).

Based on the results of the aforementioned univariate analysis, variables including age, gender, ethnicity, educational level, and systemic and ocular diseases were assigned values, and a multivariate logistic regression analysis was subsequently conducted. The analysis revealed that female gender, age, diabetes mellitus, age-related cataract and meibomian gland dysfunction were identified as independent risk factors for pterygium development in this region ( $P < 0.05$ ) (Table 2).



**Figure 3 Clinical characteristics of pterygium in pterygium patients during 2023** laterality (unilateral or bilateral) (A), anatomical location (B), disease status (primary or recurrent) (C), and severity grading (D)

**Table 2 Multivariate logistic regression analysis of factors influencing pterygium development**

Factors	B	SE	Wald $\chi^2$	P value	OR value	95% CI
Gender	1.935	0.249	60.300	0.000	6.922	(4.248, 11.280)
Age	-0.735	0.259	8.055	0.005	0.480	(0.289, 0.797)
Ethnic groups	0.147	0.224	0.429	0.512	1.158	(0.746, 1.797)
Educational attainment levels	0.295	0.245	1.451	0.228	1.343	(0.831, 2.172)
Hypertension	0.127	0.250	0.259	0.611	1.136	(0.696, 1.854)
Diabetes mellitus	1.473	0.484	9.284	0.002	4.364	(1.691, 11.258)
Age-related cataract	1.111	0.273	16.599	0.000	3.306	(1.779, 5.180)
Meibomian gland dysfunction	2.730	0.216	159.789	0.000	15.338	(10.044, 23.422)

## DISCUSSION

In this study, we retrospectively analyzed demographic and clinical characteristics of hospitalized pterygium patients in 2023. Findings showed distinct epidemiological patterns in Fengqing, including gender distribution, age-specific prevalence, and recurrence rates. We explored underlying causes of these results, aiming to provide epidemiological insights for targeted public health and poverty alleviation strategies.

### Significantly higher prevalence of pterygium among females than males

A notable epidemiological feature emerging from this study is the significantly higher prevalence of pterygium among females compared to males, with a ratio of 6.67:1. This stands in stark contrast to the regional sex ratio of 105.31 males per 100 females.<sup>[12]</sup> This disparity might be attributed to women's higher exposure to ultraviolet (UV) radiation, as they are more frequently engaged in outdoor agricultural activities.<sup>[13]</sup>

Fengqing is an agricultural county and its economy heavily depends on tea and walnut cultivation.<sup>[14]</sup> The labor-intensive nature of tea and walnut production demands specific physical attributes such as optimal height, endurance, and manual dexterity - qualities that predominantly suit female workers. Women are reported to outnumber men by a factor of 2-5 times in essential farming activities such as weeding, fertilizing, irrigation, and harvesting.<sup>[13]</sup> Moreover, a significant number of male labour have migrated from mountainous areas, leading women to take on increasingly critical roles in maintaining agricultural and forestry operations.<sup>[13]</sup> These factors likely contribute to women's prolonged exposure to UV radiation, which in turn may explain their higher prevalence of pterygium.

### **Hospitalized pterygium patients concentrating in the 46-55 age group**

Another notable epidemiological pattern identified in our study was the concentration of hospitalized pterygium patients within the 46-55 age group, account for 36.7% of cases. In contrast, there were significantly fewer cases among individuals aged over 65 years (14%). This finding deviated from the widely accepted notion that there is a positive correlation between the incidence of pterygium and increasing age.<sup>[14]</sup> Interestingly, the proportion of patients under 45 years old was relatively high at 23.2%, which was higher compared to other regions in China.<sup>[1, 15-16]</sup>

In fact, during previous rural eye health screenings, we discovered a substantial number of undiagnosed pterygium cases among elderly populations. Despite experiencing symptoms, people with pterygium had barriers impeding their access to healthcare. Firstly, there are geographical constraints. Fengqing is mountainous terrain (94.7% of the area is mountainous), and has underdeveloped transportation infrastructure.<sup>[17]</sup> With predominantly rural mountain roads and limited number of secondary highways, travel to the county hospital from remote areas typically takes more than 2 hours. Secondly, there are physical limitations. Elderly patients often cannot withstand the physical demands of traveling through mountainous regions. Thirdly, there are socioeconomic barriers. Limited household income, the lack of family members to accompany them for medical visits, and inadequate rural pension security levels are also major factors that prevent elderly

rural residents from seeking medical care outside their communities.<sup>[18-19]</sup> These combined factors lead to significant disparities in healthcare access, particularly for elderly population in remote mountainous regions.

### **Recurrent pterygium cases being relatively uncommon among surgical patients**

Our study documented a relatively low incidence of recurrent pterygium cases, leading us to hypothesize that this does not reflect the true recurrence rates in this region. Due to limited knowledge of available treatment options, coupled with financial constraints and geographical barriers, patients may hesitate to seek secondary medical consultations when the disease recurs.<sup>[18-19]</sup> Fengqing is a multi-ethnic region where the Han culture coexists and interacts with ethnic minority cultures, as well as inland and frontier civilizations. The long-standing interplay between biology and culture has a profound influence on the health status, disease progression, and healthcare-seeking behaviors of the local population.<sup>[20-21]</sup> Within this cultural context, a tripartite medical system has developed locally, comprising herbal medicine, shamanistic healing, and Western medicine.<sup>[22]</sup> After surgical recurrence, individuals may question the effectiveness of Western medicine and appeal for other forms of healthcare. For instance, they might seek treatment from a herbalist or purchase folk remedies for their ailments.<sup>[19]</sup> This complex interplay of cultural, economic, and healthcare system factors is likely responsible for the observed patterns of recurrent case presentation.

### **Ocular and systematic disorders associated with pterygium development**

Hypertension, diabetes mellitus, meibomian gland dysfunction (MGD), and age-related cataract are among the predominant health issues in Fengqing County. Univariate analysis has revealed significant differences in the prevalence of these factors among patients with pterygium. The local predilection for high-sodium diets is a contributing factor to the notably high hypertension prevalence rate of 51.81%.<sup>[23]</sup> Moreover, the region's distinctive geographical features, including its high altitude, intense ultraviolet radiation, and arid, windy weather, predispose the inhabitants to a variety of ocular surface disorders, with MGD being particularly prevalent.<sup>[24]</sup> The multivariate regression analysis

conducted in this study confirms that MGD is a significant risk factor for the development of pterygium. This finding further supports the high incidence and interconnection of ocular surface diseases in this area.

This study has certain limitation. It investigated disease prevalence using annual ophthalmic inpatient data, which provides some insights into disease characteristics. Nevertheless, potential selection biases may exist due to the hospital-based study design. Future research should conduct population-based, multiethnic epidemiological surveys that incorporate robust sampling methodologies to generate more accurate and generalizable findings.

Based on our findings, we propose the following evidence-based recommendations for medical poverty alleviation initiatives. Firstly, local medical institutions could develop culturally sensitive health education programs focusing on common eye diseases. Secondly, an intelligent "Three-tier Diagnosis and Treatment Platform" should be established through collaboration with Zhongshan Ophthalmic Center, Sun Yat-sen University.<sup>[25]</sup> Furthermore, county hospitals can set up ophthalmic expert workstations in rural areas as their subsidiaries and offer ophthalmic skills training. Lastly, with regard to medical insurance, it would be advisable to increase the reimbursement rate for common local diseases such as pterygium. This is of utmost importance for alleviating the financial burden on families caused by medical expenses and preventing the recurrence of poverty due to illness.

### Correction notice

None

### Acknowledgement

The authors extend their sincere gratitude to Mr. Xin Huang, First Secretary of Hongtang Village in Fengqing County and faculty member of Sun Yat-sen University, for his invaluable insights regarding the socioeconomic and health status of rural populations in Fengqing. It is worth noting that Mr. Huang is also a teacher dispatched by Sun Yat-sen University to participate in the poverty alleviation project.

### Author Contributions

(I) Conception and design: Yun Xie, Chunxiao Wang  
 (II) Administrative support: Chunguang Li, Yimin Zhong, Chunxiao Wang  
 (III) Provision of study materials or patients: Yun Xie,

Wending Li, Hongyang Zhao, Guifei Zhang, Liqin Hong

(IV) Collection and assembly of data: Yun Xie, Wending Li, Hongyang Zhao, Guifei Zhang, Liqin Hong

(V) Data analysis and interpretation: Yimin Zhong, Chunxiao Wang

(VI) Manuscript writing: All authors

(VII) Final approval of manuscript: All authors

### Funding

This study is supported by Guangdong Basic Research Center of Excellence for Major Blinding Eye Diseases Prevention and Treatment (2024-YXGG-016).

### Conflict of Interests

None of the authors has any conflicts of interest to disclose. All authors have declared in the completed the ICMJE uniform disclosure form.

### Patient consent for publication

None

### Ethical Statement

None

### Provenance and Peer Review

This article was a standard submission to our journal. The article has undergone peer review with our anonymous review system.

### Data Sharing Statement

None

### Open Access Statement

This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license).

## References

1. Dong YP, Wang YJ, Wang JM, et al. Investigation on the prevalence and influencing factors of pterygium in Gannan ethnic minority areas. *Anhui Medical and Pharmaceutical Journal*. 2024, 28(03): 568-571. DOI:10.3969/j.issn.1009-6469.2024.03.031.
2. Zhang XY, Yan X, Guan RJ, et al. Analysis of risk factors related to pterygium and establishment of prediction model

- in plateau area. *Int Eye Sci.* 2022, 22(7): 1215-1219. DOI: 10.3980/j.issn.1672-5123.2022.7.30.
3. Ke HQ, Zhang WJ, Liu H, et al. Prevalence and risk factors of pterygium in Zhuang and Miao nationality adults aged 40 and over in Wenshan prefecture, Yunnan Province. *Int Eye Sci.* 2022, 22(02): 347-351. DOI: 10.3980/j.issn.1672-5123.2022.2.35.
  4. Li X. Epidemiology of pterygium on Bai minority in Yunnan province, China; A population-based study. Kunming Medical College, Master degree thesis, 2011.
  5. Chen YM. Epidemiological investigation of keratosis in Jiashi County, southern Xinjiang. *J Henan Univ Med Sci.* 2019, 38(4): 261-262. DOI: 10.15991/j.cnki.41-1361/r.2019.04.008.
  6. Wang JW, Zhang Y, Chen XD, et al. Epidemiologic survey of pterygium in the middle-aged and the senile in defined rural area of Heilongjiang Province. *Int Eye Sci.* 2016, 16(5): 930-933. DOI:10.3980/j.issn.1672-5123.2016.5.35.
  7. Gan LY. Prevalence and risk factors among Han and Titetan Population in Qinghai Province. Peking Union Medical College, Doctoral thesis, 2016.
  8. Ma WZ. Prevalence and associated risk factors of pterygium among adults aged 50 years and above in Juancheng County. Shandong University, Master degree thesis, 2015.
  9. Su XL, Zhao FT, Li ZH, et al. Epidemiologic Survey and Analysis of Related Risk Factors for Ocular Pterygium in Shunde District of Foshan City. *China Health Standard Management.* 2017, 8(03):3-5. DOI: 10.3969/j.issn.1674-9316.2017.03.002.
  10. Fengqing County People's Government Network. <https://www.ynfq.gov.cn/index.htm>.
  11. Tan CSH, Lim TH, Koh WP, et al. Epidemiology of pterygium on a tropical island in the Riau Archipelago. *Eye (Lond).* 2006, 20(8): 908-912. DOI: 10.1038/sj.eye.6702046.
  12. Official Website of Fengqing County People's Government. Main Data Bulletin of the Seventh National Population Census of Fengqing County. <https://www.ynfq.gov.cn/info/1009/189182.htm>.
  13. Shen C. Research on Economic Forest Development from the Perspective of Gender: a Case Study of Fengqing County, Yunnan Province. Yunnan University, Master's Thesis, 2008.
  14. Xing Y, Jiang FF, J B, et al. Analysis of the epidemiology and risk factors of pterygium in 116 elderly patients in Hefei area. *Chinese Journal of General Practice,* 2020, 18(8): 1279-1282. DOI: 10.16766/j.cnki.issn.1674-4152.001485.
  15. Luo ZL, Zhang LX, Zhu GP. Prevalence survey on pterygium among people aged 40 and above in Hengli Town of Dongguan. *Int Eye Sci,* 2014, 14(7): 1292-1294. DOI: 10.3980/j.issn.1672-5123.2014.07.33.
  16. Liu BB, Zhang XF, Wu QF. Etiological investigation of pterygium in eastern Fujian. *Medical Theory and Practice.* 2016, 29 (21): 3001-3002. DOI: 10.19381/j.issn.1001-7585.2016.21.070.
  17. Yu SP, Zhao ZK. To protect ecological environment and improve social and economic development in Fengqing County. *Yunnan Environmental Science.* 2005, 24(Supplement): 94-95.
  18. Yang ZH, Wu XL, Li LY. Current situation and thinking of rural old-age care-taking Guodazhai village, Guodazhai township, Fengqing county, Yunnan province as an example. *Rural Theory Series.* 2021, 3: 109-117.
  19. Gao F. A Preliminary Study on the selection of behavior of seeing doctor among villagers of Yi people in southwest Yunnan province--a case study of K village in Fengqing county, Yunnan province. *J of Guizhou Uni Eng Sci.* 2018, 5(36): 30-35. DOI: CNKI:SUN:BJSZ.0.2018-05-005.
  20. Li WY. The current situation and trend of ethnomedicine research in China from the perspective of medical anthropology. *J Origin Ecol Nat Cul.* 2020, 12(4): 63-70.
  21. Zhang WY. The nexus of society and biology: international research trends in medical anthropology. *Medic Philosop,* 2017, 38(10): 39-42.
  22. Cheng Y, Peng YT, Wei W. Research on targeted poverty alleviation of health under multiple medical system --take Fengqing of Yunnan as an example. *Qinghai J Ethnol.* 2021, 32(03): 162-167.
  23. Huang SJ, Shao Y, Miao Y, et al. Analysis on the prevalence and influence factors of chronic diseases among the elderly aged 65 in Fengqing county in 2022. *Occup Health Damage.* 2024, 39(3): 147-153. DOI: 10.19973/j.cnki.1006-172X.230132.
  24. Zhang XJ, Li XZ, Suo NC, et al. Investigation and analysis of meibomian gland function in Tibetan population over 50 years old at high altitude. *Journal of High Altitude Medicine.* 2023, 33 (3): 59-63. DOI: 10.3969/j.issn.1007-3809.2023.03.015.
  25. Wu X, Wu Y, Tu Z, et al. Cost-effectiveness and cost-utility of a digital technology-driven hierarchical healthcare screening pattern in China. *Nat Commun.* 2024, 15(1): 3650. DOI: 10.1038/s41467-024-47211-w.