• Investigation •

Prevalence of pterygium and pinguecula and their risk factors: Tehran Geriatric Eye Study

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Received: 2024-05-15 Accepted: 2024-08-20

Abstract

• **AIM:** To explore the prevalence of pterygium and pinguecula and their risk factors.

• **METHODS:** This population-based cross-sectional study was conducted on geriatric population aged 60 and over in Tehran, Iran from Jan 2019 to Jan 2020. Selected subjects were interviewed and subjected to optometric and ophthalmic examinations.

• **RESULTS:** The age and sex standardized prevalence of pterygium and pinguecula was 3.64% [95% confidence interval (CI): 2.94%–4.49%] and 55.57% (95%CI: 52.89%–58.22%), respectively. The prevalence of pterygium was 4.52% (95%CI: 3.5%–5.81%) in men and 2.79% (95%CI: 1.97%–3.94%) in women and the prevalence of pinguecula was 64.56% (95%CI: 60.92%–68.03%) in men and 46.72% (95%CI: 43.74%–49.72%) in women. According to the results of multiple logistic regression, pinguecula had a significant correlation with male sex [odds ratio (OR): 2.21, 95%CI: 1.63–2.99] and education level (OR: 0.52, 95%CI: 0.35-0.77) and pterygium had a significant relationship with male sex (OR: 2.2, 95%CI: 1.38–3.52), socioeconomic status (SES, OR: 0.5, 95%CI: 0.26–0.97), education level (OR: 0.22, 95%CI: 0.08–0.61).

• **CONCLUSION:** The prevalence of pinguecula and pterygium in this study are lower than other studies. Sex, SES, and education level are the risk factors of the prevalence of pinguecula and pterygium.

• **KEYWORDS:** pterygium; pinguecula; geriatric population; epidemiology
DOI:10.18240/ijo.2025.04.17

Citation: Hashemi A, Aghamirsalim M, Hashemi H, Malekifar P, Khabazkhoob M. Prevalence of pterygium and pinguecula and their risk factors: Tehran Geriatric Eye Study. *Int J Ophthalmol* 2025;18(4):699-706

INTRODUCTION

Pinguecula and pterygium are degenerative conditions of the conjunctiva that share similar etiologies and risk factors according to many researchers[1-2]. Pinguecula is characterized by a yellowish nodule on the bulbar conjunctiva near the limbus that never enters the cornea, while pterygium is in fact an abnormal subepithelial growth of a triangular fibromuscular tissue from the conjunctiva towards the cornea that may involve both the cornea and the conjunctiva[3]. Pterygium usually causes more ocular and visual problems compared to pinguecula. In contrast to pinguecula, severe pterygium, in addition to cosmetic issues, may lead to visual problems due to irregular astigmatism or may cause visual impairment due to occluding the visual axis[4-5].

Previous studies found that pinguecula was much more prevalent than pterygium. The prevalence of these two conditions varies in different parts of the world[6-9]. The results of a Meta-analysis showed that the prevalence of pterygium was 12% across the world[1]. An even smaller number of studies have evaluated pinguecula according to which the prevalence of this condition is 17.4%–75.6% in different parts of the world[10-11].

Although the main etiology of these two conditions is not clear, different factors like climatic conditions[12], sex[6,13-14], ethnicity[6,15], and occupation[16] may affect their prevalence. Age is one of the most important factors according to several studies and the prevalence of these two disorders is higher in the elderly population compared to other age groups[13,17].

The world's population is ageing and elderly people comprise about 22% of the global population by 2050[14]. Therefore,

attention should be paid to the health of this age group, especially in developing countries where they will constitute about 80% of the population[14]. The year 2020 is a good opportunity for healthcare authorities in these countries to review the current status, challenges, and the extent to which VISION 2020 objectives have been achieved. Iran is a developing country located on the pterygium belt (between 37° north and south of the equator) with a reported prevalence of 11%, 13%, and 61% for pterygium and pinguecula in different parts[18-19]. The prevalence of these conditions has not been evaluated in the available studies. This study was conducted to determine the prevalence of pterygium and pinguecula in the geriatric population of Tehran.

PARTICIPANTS AND METHODS

Ethical Approval Informed consent was obtained from all participants. For illiterate participants, the goals and steps of the study were fully explained and verbal consent was taken; they also confirmed the consent form with a thumbprint. The principles of the Helsinki Declaration were followed in all stages of this study. The protocol of the study was approved by the Ethics Committee of the National Institute for Medical Research Development (NIMAD) under the auspices of the Iranian Ministry of Health (ethical code: IR.NIMAD.REC.1397.292).

Design and Sampling This population-based cross-sectional study was conducted in over 60-year population of Tehran, capital of Iran, from Jan 2019 to Jan 2020. Multistage stratified random cluster sampling was used to select the participants. A sample size of 3200 subjects was calculated considering a prevalence of 5.2% for visual impairment as the main outcome of the study, precision of 1%, confidence interval of 95%, a design effect of 1.5, and a non-response rate of 10%. Then, 160 blocks each containing 20 subjects were randomly selected from all 22 districts of Tehran such that the number of clusters in each district was proportional to its population. The collected data included complete demographic characteristics, socioeconomic status (SES), and the results of optometric and ophthalmic examinations.

Examinations and Definitions After optometric examinations conducted by an optometrist, complete ophthalmic examinations including slit lamp biomicroscopy of the anterior and posterior segments was done by an ophthalmologist using the B900 slit lamp (Haag-Streit AG, Bern, Switzerland) and a +90 D lens.

Two ophthalmologists, having received the same training to detect pathologies, carried out the examinations. They achieved 100% agreement on the diagnoses of pterygium and pinguecula in 24 cases. Furthermore, there was a 91% agreement in their grading of pterygium.

The anterior segment was thoroughly examined for the presence of pinguecula and pterygium. Pinguecula was defined as a yellowish tissue on the nasal or temporal conjunctiva. The presence of a radially oriented fibrovascular lesion crossing the nasal or temporal limbus indicated a diagnosis of pterygium.

The grade and stage of pterygium were used to determine the extent and severity of ocular involvement.

The extent of the involvement of episcleral vessels was used to grade pterygium. Episcleral vessels are clearly distinguished in grade T1 (atrophic), the blood vessels are partially visible in T2 (intermediate), and the blood vessels are totally obscured by the fibrovascular tissue in T3 (fleshy or opaque)[20].

Pterygium was also divided into three stages. In stage 1, the head of pterygia did not reach the midline between the limbus and pupillary margin. In stage 2, the head of pterygia passed the midline but did not reach the pupil. In stage 3, the head of pterygia passed the pupillary margin.

To determine the SES, the data of 15 household assets was collected and a quantitative parameter was generated using principle component analysis. The SES was cauterized into three categories as low, medium, and high.

The determination of pterygium and pinguecula locations depended on the type of involvement of the eyes; if only one eye showed signs, the location was noted within that eye. In cases where both eyes were involved, the location was determined based on the eye with the more severe condition.

Statistical Analysis Quantitative variables are reported as mean and standard deviation and qualitative variables are presented as percentage. The age and sex-standardized prevalence of pterygium and pinguecula were calculated using the population of Tehran and weighted sample. The cluster effect was considered for accurate estimation of the standard error. Simple and multiple logistic regression models were applied to investigate the relationship between different variables and the prevalence of pterygium and pinguecula. *P* values less than 0.05 were considered significant in all analyses.

RESULTS

Of 3791 invited subjects, 3310 participated in the study (response rate=87.31%).

The mean age of the participants was 69.35±7.62y (range: 60–97y); moreover, 42.24% of the participants were male, 57.76% were female, and 12.48% had a university education. Furthermore, 83.04% of the men were retired and 84.25% of the women were homemakers.

Table 1 showed the prevalence of pinguecula and pterygium according to grade, stage, involved eye, and involved site.

The prevalence of pinguecula was 55.57% [95% confidence interval (CI): 52.89%–58.22%] in the study population. The prevalence of bilateral pinguecula was 51.69% (95%CI: 49.14%–54.24%) and the nasal conjunctiva was involved in 34.12 (95%CI: 31.75%–36.57%) of the subjects.

Table 1 Age and sex standardized prevalence of pterygium and pinguecula according to involved eye, grade, and involved site

Variables	Pinguecula prevalence % (95%CI)	Pterygium prevalence % (95%CI)
Involved eye		
Total	55.57 (52.89–58.22)	3.64 (2.94–4.49)
Unilateral	3.88 (3.18–4.73)	2.21 (1.63–2.98)
Bilateral	51.69 (49.14–54.24)	1.44 (1.02–2.02)
Grade		
Atrophic (T1)		2.25 (1.73–2.93)
Intermediate (T2)		1.22 (0.80–1.87)
fleshy, opaque (T3)		0.17 (0.06–0.49)
Stage		
Stage 1		2.29 (1.78–2.95)
Stage 2		1.17 (0.78–1.74)
Stage 3		0.19 (0.07–0.05)
Involved site		
Nasal	34.12 (31.75–36.57)	2.30 (1.72-3.06)
Temporal	3.01 (2.44–3.73)	0.37 (0.16-0.86)
Both	17.98 (15.92–20.24)	0.97 (0.69-1.38)

CI: Confidence Interval.

Pterygium had a prevalence of 3.64% (95%CI: 2.94%–4.49%) in the study population and was bilateral in 2.21 (95%CI: 1.63%–2.98%) of the participants. The prevalence of pterygium according to grade and stage is presented in Table 1. Grade 1 and stage 1 pterygium had the highest prevalence (2.25%, 95%CI: 1.73%–2.93% and 2.29%, 95%CI: 1.78%–2.95%, respectively).

Table 2 showed the age and sex adjusted prevalence of pterygium and pinguecula according to their determinants. The prevalence of pinguecula was 64.56% (95%CI: 60.92%–68.03%) in men and 46.72% (95%CI: 43.74%–49.72%) in women. The prevalence of pinguecula increased with age reaching a peak in the age group 75–79y (57.29%, 95%CI: 51.29%–63.09%). However, the lowest prevalence was seen in subjects aged 80 and over (53.65%, 95%CI: 46.39%–60.76%). The prevalence of pinguecula decreased with an increase in the education level and the lowest prevalence was seen in participants with a university education (48.91%, 95%CI: 42.56%–55.29%). The prevalence of pinguecula was lower in subjects with a high SES (51.02%, 95%CI: 47.16%–54.87%) compared to other SES groups. The lowest prevalence of pinguecula was seen in Housekeepers (48.05%, 95%CI: 44.85%–51.27%) while the highest prevalence was seen in jobless subjects (69.11%, 95%CI: 59.77%–77.12%). The prevalence of pinguecula was higher in smokers (63.91%, 95%CI: 58.64%–68.87%) versus non-smokers.

The prevalence of pterygium was 4.52% (95%CI: 3.5%–5.81%) in men and 2.79% (95%CI: 1.97%–3.94%) in women. The prevalence of pterygium increased with age such that the lowest (2.18%, 95%CI: 1.39%–3.4%) and highest prevalence (5.8%, 95%CI: 3.08–10.64) was seen in the age group 60–64y and over 80y, respectively. The prevalence of pterygium decreased with an increase in the education level and was 8.31% (95%CI: 5.77%–11.83%) in illiterate subjects and 1.43% (95%CI: 0.65%–3.11%) in participants with a university education. As for the SES, the lowest prevalence of pterygium with seen in subjects with a high SES (1.68%, 95%CI: 1.08%–2.6%) and highest prevalence was seen in the low SES group (5.62%, 95%CI: 4.21%–7.48%). The prevalence of pterygium was also different according to the occupation status. The highest prevalence was seen in jobless subjects (5.16%, 95%CI: 2.6%–9.98%) and the lowest prevalence was observed in participants who worked (2.95%, 95%CI: 1.1%–7.67%). The prevalence of pterygium was lower in smokers (2.9%, 95%CI: 1.69%–4.92%) *vs* non-smokers

Table 2 presented the results of simple logistic regression analysis. According to the results, pinguecula had a significant correlation with sex (P≤0.001) such that its odds ratio (OR) was 2.08 (95%CI: 1.75–2.47) in men compared to women. The prevalence of pinguecula decreased with an increase in the education level. The odds of pinguecula were 0.67 (95%CI: 0.51–0.87) lower in subjects with a high school education compared to illiterate participants (P=0.003). The odds of pinguecula were lower in the high versus low SES group (OR=0.77, 95%CI: 0.63–0.93, P=0.007) and in homemakers versus the subjects who worked (OR=0.5, 95%CI: 0.33–0.77, P=0.001). Smoking was also associated with pinguecula and the odds of this condition were 1.5 (95%CI: 1.19–1.89) times higher in smokers versus non-smokers (P=0.001).

According to Table 2, sex had a significant correlation with pterygium and its odds were 1.65 (95%CI: 1.06–2.56) times higher in men compared to women. Age also correlated with pterygium and its odds ratio increased with age in older age groups compared to the age group 60–64y such that its odds were 2.76 (95%CI: 1.22–6.27) times higher in subjects over 80y compared to the age group 60–64y (P=0.015). The odds of pterygium decreased with an increase in the education level. The odds ratio of this condition was 0.16 (95%CI: 0.07–0.39; P≤0.001) in subjects with a university education compared to illiterate participants. The odds of pterygium were also lower in the high SES group versus subjects with a low SES (OR=0.29, 95%CI: 0.16–0.5; P<0.001).

Table 3 presented the results of multiple logistic regression analysis for the prevalence of pterygium and pinguecula. According to the results, pinguecula had a significant correlation with sex and education level. The OR of pinguecula were 2.21 (95%CI: 1.63–2.99) times higher in men (P<0.001); moreover, its OR were lower in subjects with a university education compared to illiterate participants (OR=0.52, 95%CI: 0.35–0.77; P=0.001).

Table 2 Age and sex standardized prevalence and simple logistic regression analysis

Variables	*n*	Pinguecula			Pterygium		
		Prevalence % (95%CI)	Simple regression		Prevalence % (95%CI)	Simple regression	
			Odds ratio (95%CI)	*P*		Odds ratio (95%CI)	*P*
Gender[a]							
Female	1912	46.72 (43.74–49.72)	1	-	2.79 (1.97–3.94)	1	-
Male	1398	64.56 (60.92–68.03)	2.08 (1.75–2.47)	<0.001[b]	4.52 (3.50–5.81)	1.65 (1.06–2.56)	0.026[b]
Age group[a]							
60–64y	1165	54.59 (50.85–58.28)	1	-	2.18 (1.39–3.40)	1	-
65–69y	954	56.16 (52.46–59.79)	1.07 (0.89–1.27)	0.481	3.11 (2.16–4.45)	1.44 (0.78–2.65)	0.237
70–74y	634	56.90 (52.14–61.53)	1.10 (0.89–1.36)	0.387	4.35 (2.93–6.41)	2.04 (1.13–3.69)	0.018
75–79y	313	57.29 (51.29–63.09)	1.12 (0.86–1.45)	0.413	5.63 (3.58–8.76)	2.68 (1.39–5.17)	0.004[b]
80y and more	244	53.65 (46.39–60.76)	0.96 (0.70–1.32)	0.813	5.80 (3.08–10.64)	2.76 (1.22–6.27)	0.015[b]
Education level							
Illiterate	448	61.67 (56.41–66.68)	1	-	8.31 (5.77–11.83)	1	-
Primary school	1013	56.21 (52.03–60.30)	0.80 (0.61–1.04)	0.094	3.97 (2.84–5.51)	0.46 (0.27–0.76)	0.003[b]
Guide school	616	59.30 (54.10–64.31)	0.91 (0.68–1.21)	0.503	3.16 (1.90–5.21)	0.36 (0.19–0.68)	0.002[b]
High school	820	51.81 (47.73–55.86)	0.67 (0.51–0.87)	0.003[b]	1.91 (1.13–3.20)	0.22 (0.12–0.40)	<0.001[b]
Collage	413	48.91 (42.56–55.29)	0.59 (0.43–0.83)	0.429	1.43 (0.65–3.11)	0.16 (0.07–0.39)	<0.001[b]
SES							
Low	1169	57.58 (53.96–61.11)	1	-	5.62 (4.21–7.48)	1	-
Middle	1045	57.96 (54.26–61.58)	1.02 (0.85–1.21)	0.858	3.35 (2.36–4.75)	0.58 (0.37–0.91)	0.017[b]
High	1096	51.02 (47.16–54.87)	0.77 (0.63–0.93)	0.007[b]	1.68 (1.08–2.60)	0.29 (0.16–0.50)	<0.001[b]
Occupation							
Employed	111	64.70 (54.93–73.38)	1	-	2.95 (1.10–7.67)	1	-
Retired	1443	60.16 (56.37–63.84)	0.82 (0.54–1.26)	0.365	4.11 (3.09–5.46)	1.41 (0.49–4.04)	0.517
jobless	135	69.11 (59.77–77.12)	1.22 (0.71–2.11)	0.474	5.16 (2.60–9.98)	1.79 (0.51–6.24)	0.358
Housekeeper	1635	48.05 (44.85–51.27)	0.50 (0.33–0.77)	0.001[b]	3.01 (2.09–4.32)	1.02 (0.34–3.06)	0.969
Smoking							
No	2877	54.14 (51.30–56.96)	1	-	3.77 (3.02–4.72)	1	-
Yes	433	63.91 (58.64–68.87)	1.50 (1.19–1.89)	0.001[b]	2.90 (1.69–4.92)	0.76 (0.42–1.36)	0.356

[a]Standardized to Tehran 2019 population census; [b]Significant. CI: Confidence Interval; SES: Socioeconomic status.

The OR of pterygium were higher in men compared to women (OR=2.2, 95%CI: 1.38–3.52; *P*=0.001). After controlling other determinants, the OR of pterygium decreased with an increase in the education level. The OR of pterygium were 0.22 (95%CI: 0.08–0.61) times higher in illiterate subjects compared to those with a university education (*P*=0.004). SES was another determinant of the prevalence of pterygium and the OR of this condition in the high SES group versus the low SES group was OR=0.5, 95%CI: 0.26–0.97; *P*=0.040.

The results of multiple logistic regression analysis did not show any significant correlation between pinguecula and SES, occupation, and smoking and between pterygium and age (Table 3).

The average refractive astigmatism in eyes affected by pterygium was found to be -1.53±1.4 D, compared to -1.1±0.91 D in those without pterygium, indicating a statistically significant difference (*P*<0.001). Additionally, the investigation into corneal astigmatism revealed a statistically significant difference, with average values of 1.61±1.77 D and 1.03±0.85 D in eyes with and without pterygium, respectively (*P*<0.001).

DISCUSSION

This study, which was part of the Tehran Geriatric Eye Study (TGES), was conducted to estimate the age and sex standardized prevalence of pterygium and pinguecula in the over-60 population of Tehran, Iran in 2019. Since these two ocular conditions, especially pinguecula, have a high prevalence, they can affect the quality of life of the patients. Therefore, accurate estimation of their prevalence and identifying their risk factors can help to prevent these disorders and discover new treatment methods.

The prevalence of pterygium was 3.64% in this study. A review of the previous studies shows that the prevalence of pterygium varies in different elderly populations. Table 4[9-10,14,19,21-31] provided a summary of the previous studies investigating the prevalence of pterygium in the elderly.

Table 3 Association between pinguecula and pterygium and some factors according to multiple logistic regressions

Variables	Multiple logistic regression	
	Odds ratio (95%CI)	*P*
Pinguecula		
Gender		
Female	1	-
Male	2.21 (1.63–2.99)	<0.001[a]
Education level		
Illiterate	1	-
Primary School	0.76 (0.57–1.01)	0.057
Guide School	0.84 (0.61–1.15)	0.274
High School	0.61 (0.45–0.83)	0.002[a]
Collage	0.52 (0.35–0.77)	0.001[a]
SES		
Low	1	-
Middle	0.96 (0.79–1.17)	0.710
High	0.80 (0.64–10.00)	0.053
Occupation		
Employed	1	-
Retired	0.89 (0.58–1.38)	0.606
jobless	0.98 (0.56–1.72)	0.939
Housekeeper	0.89 (0.54–1.46)	0.634
Smoking		
No	1	-
Yes	1.12 (0.88–1.42)	0.366
Pterygium		
Gender		
Female	1	-
Male	2.20 (1.38–3.52)	0.001[a]
Age group		
60–64y	1	-
65–69y	1.26 (0.68–2.32)	0.464
70–74y	1.58 (0.85–2.95)	0.146
75–79y	1.89 (0.94–3.80)	0.072
80y and more	1.46 (0.63–3.36)	0.374
Education level		
Illiterate	1	-
Primary school	0.48 (0.30–0.78)	0.003[a]
Guide school	0.41 (0.22–0.75)	0.004[a]
High school	0.29 (0.15–0.55)	<0.001[a]
Collage	0.22 (0.08–0.61)	0.004[a]
SES		
Low	1	-
Middle	0.77 (0.50–1.17)	0.220
High	0.50 (0.26–0.97)	0.040[a]

SES: Socioeconomic status; CI: Confidence Interval. [a]Significant.

According to Table 4, the prevalence of pterygium ranges from 58.8% in Brazil (Amazonas State) to 2.4% in Saudi Arabia[10,14]. Since the study populations of these studies are similar, it seems that factors other than age may affect this difference. One of these factors is the longitude and latitude such that proximity to the equator may increase the prevalence of pterygium[21]. According to Table 4, Brazil (Amazonas State, 2.63 S 56.73 W) is nearer to the equator with a higher prevalence of pterygium (58.8%) compared to China (Heilongjiang, 47.12 N 128.73 E) with a prevalence of 4.3%. However, the present study found the lowest prevalence of pterygium compared to previous studies across the world. Variations in the study population (urban *vs* rural), ethnic backgrounds, and geographic factors such as proximity to the equator, may account for these discrepancies. Although genetics can also play an important role in this[22].

Research conducted in Tehran, Iran, in 2009 identified a pterygium prevalence of 7.4% among individuals aged 60 and older[32], while a separate study focusing on the underserved rural population aged 2 to 93y reported a prevalence of 13.11%[19]. These figures surpass the findings of the current study. The disparity may be attributed to factors such as rural residency and limited access to healthcare services.

Similar to previous studies in this regard, the prevalence of unilateral pterygium was higher than the prevalence of the bilateral type[9,33]. Moreover, stage 1 and grade 1 pterygium had a higher prevalence than other grades and stages. It seems patients suffering from higher stages and grades of pterygium seek surgery due to the visual effects, which reduces their prevalence.

The geographical coordinates of Iran and its neighboring countries and the region's hot and relatively arid climate may contribute to a higher prevalence of pterygium in these areas.

The prevalence of pinguecula was 55.57% in this study. Its prevalence ranges from 10.5% in India (south) to 75.57% in China (Shanghai) in the limited geriatric studies performed so far (Table 4). Differences in the age range of the participants and study population (urban and rural) may contribute to the difference in the prevalence of pinguecula. In contrast to pterygium, the prevalence of bilateral pinguecula was higher, which was consistent with previous studies[18]. The nasal site had the highest prevalence in the present study, which was similar to a study by Anbesse *et al*[23]. A study by Le *et al*[11] found that the temporal type had the highest prevalence among unilateral cases. The involved site has not been reported in other studies.

The OR of pterygium were higher in men (OR=2.2; *P*=0.001). This inter-gender difference has been reported in other studies too[6,34]. McGlacken-Byrne *et al*[6] and reported that male sex was positively associated with pterygium. However, some studies found a higher prevalence in women[24], for example, a study in Tibetans found a higher prevalence of pterygium in women. Since sun exposure and ultraviolet (UV) light are the

Table 4 Summary of other worldwide studies concerning pterygium and pinguecula published after 2015

Parameters	1st author	Year	Region	Age (y)	Sample size	Prevalence % (95%CI)	Latitude and longitude
Pterygium	Wang JW[22]	2016	China (Heilongjiang)	≤50	5669	4.30 (3.80–4.90)	128.73 E 47.12 N
	Anbesse DH[23]	2017	Ethiopia (Gondar city)	<60	390	7.97 (2.74–23.17)	12.60 N 37.45E
	Shrestha P[24]	2016	Nepal	<60	753	3.80	51.46 N 00.36 E
	Fernandes AG[10]	2020	Brazil (Amazonas state)	≤45	2384	58.80 (53.80–63.70)	02.63 S 56.73 W
	Cao XG[21]	2017	China (Guangxi)	≤50	2496	36.05	23.7 N 108.80 E
	Ke HQ[25]	2022	Qinghai-Tibetan Plateau China (Yunnan)	>40	9617	12.65 22.60 age and gender adjusted 19.60	35.70 N 96.40 E 25.0453 N 102.7097 E
	Tesfai B[26]	2021	Eritrea (Islands of Northern Red Sea Zone)	>40	787	40.00	15.1794 N 39.7823 E
	Quadi R[14]	2021	Saudi Arabia (Ta'if)	>20 to <40	12135	2.40	21.2841 N 40.4248 E
	Fekadu SA[27]	2020	Southwest Ethiopia (Gambella)	>18	400	31.80 (27.3-36.3)	8.2506 N 34.5878 E
	Pan ZX[28]	2020	China (Gansu)	40–74	4193	9.30	36.0594 N 103.8263 E
	Kassie Alemayehu T[29]	2020	Northwest Ethiopia (Kolla Diba)	18–95	605	18.50 (15.6-21.7)	12.424 N 37.325 E
	Wang YH[9]	2020	China (Inner Mongolia)	>30	2651		40.8173 N 111.7652 E
	Fernandes AG[10]	2020	Brazilian Amazon Region	>45	2041	58.80 (53.8-63.7)	3.4653 N 62.2159 E
	Bikbov MM[30]	2019	Russia (Ufa/Bashkortostan)	>40	5899	2.30 (2.0-2.7)	54.2312 N 56.1645 E
	Pan ZX[31]	2019	China (Hebei)	>40	3790	6.50 Hans 6.20 Manchus 7.20	35.7470 N 114.29.74 E
	Hashemi H[19]	2017	Iran (Dezful and Nowshahr)	2–93	3851	13.11 (11.75-14.47)	Dezful 32.3840 N 48.3996 E Nowshahr 36.6494 N 51.4887 E
Pinguecula	Tesfai B[26]	2021	Eritrea (Islands of Northern Red Sea Zone)	>40	787	32.10	15.1794 N 39.7823 E
	Fernandes AG[10]	2020	Brazilian Amazon Region	>45	2041	17.40	3.4653 N 62.2159 E

most important risk factors of this disease[35], it seems that more outdoor activities of women and more exposure to sunlight due to the lifestyle and cultural structure of this community may play a role in the higher prevalence of pterygium in women[36]. As mentioned earlier, the odds ratio of pterygium was two times higher in the low SES group compared to subjects with a high SES.

A study by Lu *et al*[36] the OR of pterygium was 1.9 in the low SES group, which was consistent with other studies[37]. The SES represents a lifestyle (using hats and sunglasses)[38] and financial ability to afford treatment (surgery)[39], which may affect the prevalence of this condition.

A low education level was also associated with pterygium in the present study. Luthra *et al*[40] investigated the relationship between years of education and pterygium and found an OR of 1.43 for the association between fewer years of education and pterygium. This relative risk was 2.46 in a study by Khanna *et al*[41].

This study found that the odds ratio of pinguecula was 2.21 in men, which was consistent with previous studies. Fotouhi *et al*[32] reported an odds ratio of 1.7 for pinguecula in men. More outdoor activities of men and increased exposure to UV light may explain this difference[42].

In the present study, education level had a significant indirect correlation with pinguecula after controlling other variables. The prevalence of pinguecula was 48.91% in subjects with a university education compared to 61.67% in illiterate participants. Viso *et al*[43] reported a prevalence of 19.5% and 55.5% in subjects with a university education and illiterate individuals, respectively. It seems that this difference is due to factors such as knowledge high-risk behavior. Training regarding the use of eye protection and sunglasses may reduce the prevalence of pinguecula.

The current research possesses both strengths and limitations. It stands out as one of the limited investigations that have utilized cluster sampling to analyze a substantial sample of individuals aged 60 and above from normal population. Nonetheless, the study's limitations include the absence of data regarding number of hours spent outdoors, nutritional status, family history related to pterygium, and dry eye conditions, which could have provided a more comprehensive understanding of the disease. Future research should take these factors into account when assessing patients.

Although the present study is valuable in terms of evaluating the status of geriatric population, the results cannot be generalized to all elderly people due to the participants' lifestyle and access to healthcare facilities as they lived in the capital of Iran. It is necessary to conduct studies in other Iranian cities to have a more accurate estimate of the prevalence of pterygium and pinguecula in Iran.

ACKNOWLEDGEMENTS

Foundation: Supported by National Institute for Medical Research Development (NIMAD) affiliated with the Iranian Ministry of Health and Medical Education (No.963660).

Conflicts of Interest: Hashemi A, None; **Aghamirsalim M,** None; **Hashemi H,** None; **Malekifar P,** None; **Khabazkhoob M,** None.

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