

# Prevalence and risk factors of pterygium and pinguecula: the Tehran Eye Study

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## Abstract

**Purpose** To determine the prevalence and causes of pterygium and pinguecula in the population of Tehran in 2002.

**Methods** In a cross-sectional population study with cluster sampling, 6497 residents of Tehran were selected from 160 clusters. Samples were chosen according to a door-to-door head counting and were then invited for free examinations. After the interview, ophthalmic examinations were performed at an eye clinic.

**Results** Of the selected sample, 4564 people (70.3%) participated in the study. The age- and gender-standardized prevalence of pterygium in this population was 1.3% (95% confidence interval (CI): 0.9–1.6%). The prevalence of pterygium was 1.4 and 1.1% in men and women, respectively ( $P > 0.05$ ). The prevalence of pinguecula in this study was 22.5% (95% CI: 21.1–24.0%); 27.1% in men and 17.7% in women ( $P < 0.001$ ). In both genders, the prevalence of pterygium and pinguecula showed a significant increase with age ( $P < 0.001$ ).

**Conclusions** This study concerns the status of pterygium and pinguecula according to age and gender in the population of Tehran. The overall prevalence rates were 1.3 and 22.5% for pterygium and pinguecula, respectively. The comparison of the results with those reported from other areas of the world suggests lower prevalence rates in Tehran.

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**Keywords:** pterygium; pinguecula  
cross-sectional study; Tehran

## Introduction

Pterygium and pinguecula are acquired lesions of the conjunctiva.<sup>1</sup> In the long term, these

conditions affect vision; however, patients request their removal mainly due to cosmetic reasons. Sun exposure plays an important role in the development of these two conditions, and reports indicate higher prevalence rates in tropical areas of the world.<sup>2,3</sup> Reports show very different results on the prevalence of pterygium; different studies state prevalence rates varying from 1.2% up to about 33%.<sup>4,5</sup> Although there are limited reports on the prevalence of pinguecula, available results indicate a high prevalence; it has been reported to be as high as 70% in some areas.<sup>6,7</sup> Studies conducted around the world emphasize the importance of pterygium and pinguecula; still comprehensive studies that determine the prevalence of these two conditions in our country have not been reported. The present report is part of the 'Tehran Eye Study' and aims at presenting the prevalence and causes of pterygium and pinguecula in Tehran urban population.

## Materials and methods

The Tehran Eye Study is a cross-sectional population-based study conducted in 2002 in Tehran. Details of its protocol have been published elsewhere<sup>8</sup> and given here in brief.

## Sample population

According to the 1996 national census, the population of Tehran was 6.8 million then. On the basis of this data, the population in Tehran was estimated 7.5 million in 2002.

Geographically, Tehran is situated at 50° east longitude and 35° north latitude. Tehran altitude varies from 1700 m in the north of the city, to 1200 m in the centre, and 1100 m in the south. The climate is generally dry and warm except in some mountainous northern parts where it is temperate. The temperature ranges

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between  $-15.0$  and  $38.7^{\circ}\text{C}$  with an annual mean of  $18^{\circ}\text{C}$ .

The sampling strategy of the study followed a stratified cluster sampling procedure with proportional allocation within Tehran districts. A total of 160 clusters were randomly selected on the basis of block enumeration of the national census of 1996 by the Statistical Center of Iran. In each cluster, the interviewer approached the first household of the cluster. After introducing themselves and the study project, the interviewers invited all household members aged 1 year and older to have a complete ophthalmic examination at Noor Vision Correction Center. Enumeration was continued for 10 neighbouring households by proceeding systematically in a clockwise direction from the initial household within the cluster.

### Examinations

All participants in the Tehran Eye Study underwent complete ophthalmic examinations. These included measurements of the uncorrected visual acuity (UCVA), best-corrected VA (BCVA), and VA with present glasses; manifest and cycloplegic refraction; spectacles lens power with the lensometer; the intraocular pressure (IOP); and slit-lamp and fundus examinations. The diagnosis of pterygium and pinguecula was based on objective findings in the clinical examinations by the ophthalmologist. During the initial interview, participants were asked about their demographics, medical and ocular history, and history of ocular trauma, diabetes, high blood pressure, and previous eye examinations.

### Statistical analysis

In this study, prevalence rates were calculated as the percentages of pterygium and pinguecula in the studied population and were determined for age and gender. The 95% confidence intervals (CI) and SE of the design effect were taken into consideration and results were adjusted. All rates have been directly standardized for age and gender in Tehran population according to the 1996 census data. Multiple logistic regression tests were used to assess the correlation between age and gender and the prevalence rates of pterygium and pinguecula. The odds ratios (ORs) and 95% CI are presented.

The Research and Ethics Committee of Noor Vision Correction Center and the Ethics Committee of the National Research Center for Medical Sciences approved the study. We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research.

### Results

During the study period from August to December 2002, 6497 eligible residents were selected through cluster sampling among which 70.3% participated in the study (4565 people). All participants, except a 1-year-old boy were examined for pterygium and pinguecula. The median age of the male and female participants was 25 and 27 years, respectively.

### Pterygium

Of the 4564 people who were examined, 66 people (1.3; 95% CI: 0.9–1.6%) had pterygium. The prevalence of pterygium in the right, left, and both eyes of the participants was 0.6, 0.4, and 0.3%, respectively. The prevalence of pterygium was not statistically significantly different between genders ( $P=0.358$ ). As shown in Table 1, there was an increase in the prevalence of pterygium with age; from 0.1% in the below 19-year-old age group of men and women ( $P<0.001$ ). After eliminating the age effect, the prevalence rate was significantly higher in 20- to 39-year-old men (OR: 4.13; 95% CI: 1.01–16.9). The prevalence of pterygium according to ethnic groups is presented in Table 2. The prevalence of pterygium was significantly lower among the Persian ethnicity group ( $P<0.001$ ).

**Table 1** Pterygium and pinguecula prevalence rates according to gender and age

	Number	Prevalence (95% confidence interval)	
		Pterygium	Pinguecula
<i>Male</i>			
1–19	814	0	0.8 (0.1–1.4)
20–39	492	0.9 (0.1–1.7)	27.4 (22.7–32.0)
40–59	395	2.8 (1.2–4.4)	66.0 (61.1–70.8)
60+	201	8.3 (4.1–12.5)	76.8 (71.5–82.2)
<i>Female</i>			
1–19	902	0.2 (0.01–0.1)	0.5 (0.2–1.4)
20–39	923	0.2 (0.005–0.9)	14.4 (11.8–17.0)
40–59	653	2.4 (1.2–3.7)	45.5 (40.9–50.1)
60+	178	7.4 (3.6–11.2)	68.0 (61.3–74.7)
<i>Male and female</i>			
1–19	1716	0.1 (0.01–0.5)	0.7 (0.2–1.1)
20–39	1415	0.5 (0.1–1.0)	21.0 (18.0–24.1)
40–59	1048	2.6 (1.5–3.7)	56.2 (52.6–59.8)
60+	386	7.8 (5.0–10.7)	72.7 (68.4–77.0)
<i>All ages</i>			
Male	1909	1.4 (0.9–1.9)	27.1 (25.1–29.0)
Female	2656	1.1 (0.7–1.5)	17.7 (16.1–19.4)
Total	4565	1.3 (0.9–1.6)	22.5 (21.1–24.0)

**Table 2** Pterygium and pinguecula prevalence rates according to ethnicity

Ethnicity	Number	Prevalence (95% confidence interval)	
		Pterygium	Pinguecula
Persian	3673	0.9 (0.6–1.2)	20.2 (18.7–21.7)
Turk	727	2.7 (1.6–3.9)	33.4 (29.7–37.1)
Kurd	62	3.6 (0.8–16.2)	35.8 (24.8–46.9)
Arab	14	0	10.5 (1.7–19.3)
Other	69	5.3 (1.6–14.2)	28.9 (18.6–41.1)
Total	4545	1.3 (0.9–1.6)	22.5 (21.1–24.0)

Participants with visual impairment due to other causes were excluded and the effect of pterygium on presenting vision was determined. This showed that visual loss was significantly worse in people who had only pterygium, than those free of this condition. The presenting vision of pterygium cases was worse than 20/40 in 20.8%, and in comparison, 5.8% of pterygium-free people had a presenting vision worse than 20/40 in the better eye ( $P < 0.001$ ). By limiting the analysis to age groups, this correlation was seen only in the above 50-year-old age group.

We then assessed the correlation between the above variables and pterygium in a multiple logistic regression model. Only age and Persian ethnicity with ORs of 1.06 and 0.38 remained in the model (Table 3).

### Pinguecula

The prevalence of pinguecula among the participants was 22.5% (95% CI: 21.1–24%). The prevalence of pinguecula in the right, left, and both eyes of the participants was 1.1, 1.5, and 19.9%, respectively. Pinguecula was seen in at least one eye of 27.1% of men and 17.7% of women. As shown in Table 1, the prevalence of pinguecula was significantly higher in men ( $P < 0.001$ ). There was a significant correlation between the prevalence of pinguecula and increasing age ( $P < 0.001$ ). According to the findings of this study, the prevalence of pinguecula was 0.7% in the below 20-year-old age group, which increased about 100-fold to 73% in the above 60-year-old age group, and showed a linear increase in all age groups (Table 1). This correlation was seen even after the gender effect was eliminated. Although the prevalence of pinguecula was higher among men, after eliminating the age effect among men, this correlation was not seen in the below 20-year-old age group. The difference in the prevalence rates for men and women in the below 20-year-old age group was only 3%, whereas in other age groups, the intergender differences were as high as 22% (Table 1). The prevalence of

**Table 3** Correlation of pterygium and pinguecula with age, gender, and ethnicity, and smoking in a separate multiple logistics regression model

	Odds ratio (95% confidence interval)	
	Pterygium	Pinguecula
<b>Age (years)</b>		
1–19	1	1
20–39	4.9 (0.9–26.1)	39.5 (20.1–77.6)
40–59	23.2 (5.1–104.1)	189.9 (96.4–374.2)
60+	73.6 (17.1–316.1)	394.1 (193.2–803.6)
<b>Gender</b>		
Female	1	1
Male	1.3 (0.7–2.2)	1.7 (1.5–2.0)
<b>Ethnicity</b>		
Persian	1	1
Turk	3.1 (1.8–5.2)	2.0 (1.6–2.3)
Kurd	4.1 (0.9–18.7)	2.2 (1.4–3.6)
Arab	0	0.46 (0.17–1.2)
Other	4.1 (1.7–9.4)	1.2 (0.7–1.7)
<b>Smoking</b>		
No	1	
Yes	2.7 (0.93–7.6)	2.53 (1.7–3.8)

pinguecula was significantly higher among smokers ( $P < 0.001$ ).

Although pinguecula alone affects VA less than pterygium, 11.5% of people affected solely by pinguecula had a presenting VA worse than 20/40, compared to 4.3% in those without pinguecula. The correlation between VA and pinguecula disappeared after adjusting for age.

The correlation between pinguecula and studied variables were assessed in a multiple logistic regression model. This showed the prevalence of pinguecula correlated with age, gender, and Persian ethnicity. Some variables such as smoking were not remained in the multiple logistic model.

### Discussion

This report, as part of the Tehran Eye Study, which was performed as a cross-sectional population study in 2002 in Tehran provides the prevalence rates of pterygium and pinguecula in the population of Tehran according to age, gender, and ethnicity. Although the study began with an acceptable sample size, 30% of the selected people did not participate. Therefore, results may be an overestimation or underestimation and they should be interpreted with caution.

According to the results of this study, the prevalence of pterygium was 1.3%, which is very different from that reported by other studies. Some reports indicate that pterygium prevalence rates are lower than 2.0% where

**Table 4** Findings of other studies on the prevalence of pterygium according to gender

Study/population	Age	Male	Female	Total
Australia <sup>4</sup> Melbourne	40 +	1.76	0.71	1.2
Australia <sup>4</sup> Nursing home	40 +		3.62	3.62
Australia <sup>4</sup> Rural	40 +	9.78	3.83	6.7
Singapore <sup>16</sup> Adult Chinese	40-79	11.2	2.6	6.9
Blue Mountains <sup>6</sup>	40 +	11	4.5	7.8
Indonesia <sup>15</sup>	21 +	10.4	9.5	10
Riau Archipelago <sup>12</sup>	0-90	22.7	12.4	17
Mongolian China <sup>11</sup>	40 +	17.1	18.7	17.9
Amazon Brazilian <sup>13</sup>	NA	15.7	20.5	18.4
Carolina <sup>14</sup> Farm workers	NA			23.3
Barbados <sup>17</sup>	40-84	23.8	23	23.4
China <sup>5</sup> Doumen County	50 +	29.7	35.7	33.1
Present study Tehran	1 +	1.4	1.1	1.3

NA = not available.

the east longitude is smaller than 40°. The findings of our study and the east longitude of Tehran verify this, and also the role of east longitude on the prevalence of pterygium.<sup>9,10</sup> In addition, the relatively young population of Tehran can partly explain the lower prevalence rate.

Compared to almost all other studies, the prevalence of pinguecula is relatively low in Tehran, and the only report indicating similar results concerns a study in Australia with a prevalence of 1.2% in Melbourne.<sup>4</sup> In contrast to the studies in Tehran and Melbourne, higher prevalence rates have been reported in other populations,<sup>6,7,11-17</sup> even as high as 33.1 and 23% in China and Carolina, respectively (Table 4).<sup>5,14</sup>

In this study, the prevalence of pterygium according to gender was higher in men only in the 20- to 39-year-old age group, and no significant correlation was seen between pterygium and gender in other age groups. This may be explained by the fact that men in this age group are more likely to be exposed to factors such as sunlight because of their occupations; however, results in other studies are very controversial. Some reports state pterygium is more prevalent among men in all age groups.<sup>4,6,12,16</sup> There are also reports indicating higher prevalence rates among women,<sup>5,13</sup> and yet some studies found no correlation between pterygium and gender (Table 4).<sup>11,15,17,18</sup>

On the basis of the results of this study, the prevalence of pterygium significantly increases with age in both genders. These results are similar to those by other studies, and most of them confirm that there is a correlation between pterygium and age.<sup>4-6,11-13,15-17</sup>

In this study, we found that a VA worse than 20/40 in the better eye is five times more likely among people with pterygium, and although this factor has been assessed in a limited number of studies, they support our

findings. This can be due to a change in the convexity of the cornea and development of astigmatism.<sup>5,11</sup>

The prevalence of pinguecula in this study was 22.0%. Studies concerning this issue are rare, and compared to these studies that report prevalence rates as high as 70%, the prevalence in Tehran is relatively low. Similar to the limited studies, we also found that the prevalence of pinguecula significantly increases with age.<sup>6,7</sup>

### Conclusion

The present report concerns the status on pterygium and pinguecula according to age and gender in the population of Tehran, which was 1.3 and 22.5%, respectively. The comparison of these results with that reported from other areas of the world indicates that the prevalence rates are lower in Tehran. Considering the effect of climate on the prevalence of pterygium and pinguecula, and the climatic diversity throughout Iran, additional cross-sectional studies in other parts of Iran are suggested.

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