

# The Prevalence of Eyelid Ptosis in Tehran Population: The Tehran Eye Study

Hassan Hashemi, MD<sup>1,2</sup> • Mehdi KhabazKhoob, MSc<sup>2</sup> • AbbasAli Yekta, PhD<sup>3</sup>  
Kazem Mohammad, PhD<sup>4</sup> • Akbar Fotouhi, MD, PhD<sup>5</sup>

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## Abstract

**Purpose:** To determine the prevalence of ptosis and its correlation with vision-related variables in Tehran population

**Methods:** Through a stratified cluster random sampling, 160 clusters were selected proportional to the population of each municipal district of the city. All consented participants were transferred to the clinic and underwent thorough eye examination. Here we report the prevalence of ptosis with 95% confidence intervals (CI), and its associations with age, gender, amblyopia, astigmatism and previous cataract surgery.

**Results:** The prevalence of ptosis in the studied population was 0.90% (95% CI: 0.58 to 1.21). The prevalence rates of bilateral and unilateral ptosis were 0.46% (95% CI: 0.23 to 0.69) and 0.44% (95% CI: 0.21 to 0.66), respectively. The prevalence of ptosis was higher in men ( $P=0.008$ ) and showed a significant increase with age ( $P=0.023$ ). The odds of amblyopia was 3.24 times higher among cases of ptosis than those free of the condition ( $P=0.048$ ). The mean cylinder error in ptotic patients was significantly higher ( $P=0.006$ ). The prevalence was more in those with previous history of eye surgery ( $P<0.001$ ).

**Conclusion:** In this study, we found that the prevalence of ptosis in Tehran's population was low, and is more common in men than women. Age was associated with its prevalence. Also, in accordance with some other studies, amblyopia was shown to be the most serious visual disorder in these cases.

**Keywords:** Ptosis, Population Based Study, Tehran

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1. Associate Professor of Ophthalmology, Eye Research Center, Farabi Eye Hospital, Tehran University of Medical Sciences
  2. Noor Ophthalmology Research Center, Noor Eye Hospital
  3. Associate Professor of Optometry, Department of Optometry, Mashhad University of Medical Sciences
  4. Professor of Epidemiology, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences
  5. Associate Professor of Epidemiology, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences

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Correspondence to: Akbar Fotouhi, MD, PhD

Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran,  
Tel:+98 21 88987381, Email: afotouhi@tums.ac.ir

## Introduction

Ptosis is an eye problem with many different predisposing factors. It can be a congenital problem or occur as an eye surgery side effect. Visual impairment and astigmatism, particularly in congenital cases, are complications of ptosis.<sup>1-3</sup> The condition affects the visual field, and in severe cases, it can cause the patient some serious problems due to visual impairment. Epidemiological studies around this issue are few. The study by Sridharan et al<sup>4</sup> is one of the published studies on the prevalence of ptosis in which a rate of 11.5% in the aged population was reported.

Considering the few epidemiological studies on ptosis, the objectives of this study were to describe the prevalence of ptosis in Tehran's population and to determine its association with vision-related variables, as a part of Tehran Eye Study (TES).

## Methods

The present study is a part of the previously described TES<sup>5</sup> in which 1600 households were selected through a stratified random cluster sampling approach. All consented participants were transferred to a clinic for an interview and went through ophthalmic examinations including visual acuity (VA), refraction, slit-lamp examination and funduscopy. The diagnosis of ptosis was made by an ophthalmologist.

Ptosis was diagnosed by measuring the margin reflex distance 1 (MRD1) which is the distance from the upper eyelid margin to the corneal light reflex. MRD1 < 4.5 mm was considered ptosis. Amblyopia was defined as a best corrected visual acuity (BCVA) of  $20/30$  or less or a difference of two lines or more on Snellen chart between the two eyes with no organic changes.

Refraction was measured by optometrists for participants over five years of age using a Topcon automated refractometer (Topcon KR 8000, Topcon Corporation, Tokyo, Japan) according to the instruction manual. Results from autorefractometry were used as a starting point for full subjective and manifest refraction.

In this study, we determined the prevalence of ptosis with its 95% confidence intervals (CI) considering the design effect. Prevalence rates of unilateral and bilateral ptosis were

determined separately, and in analyses for associations, ptosis in at least one eye was considered. Logistic regression was used for statistical analysis and odds ratios (OR) were calculated. Prevalence rates were directly age and gender standardized based on Tehran's population determined through the 1996 national census.

The Research and Ethics Committee of the Noor Vision Correction Center and Ethics Committee of the National Research Center for Medical Sciences approved the study.

## Results

Of the 6,497 sampled citizens, 4,565 participated in the study and had the interview and examinations (response rate, 70.3%). The participants had a mean age of  $30.1 \pm 18.8$  (rang: 1 to 96 years) and 1,909 were men (41.82%). The prevalence of ptosis was 0.90% (95% CI: 0.58 to 1.21).

The prevalence of unilateral and bilateral ptosis were 0.46% (95% CI: 0.23 to 0.69) and 0.44% (95% CI: 0.21 to 0.66), respectively. Table 1 demonstrates ptosis prevalence rates in different age groups. The prevalence of ptosis increased significantly by age increment (OR=1.02 for each year, 95% CI: 1.01 to 1.04, and was significantly higher in men (OR=2.55, 95% CI: 1.28 to 5.09). Comparison of BCVA in participants with and without ptosis is showed in figure 1. After excluding participants with cataract, ptotic participants had less BCVA of  $20/20$  that those without ptosis (P=0.012).

The prevalence of amblyopia in ptotic cases was 15.4% which indicates that the risk of amblyopia in these cases was 3.24 (95% CI 1.11 to 9.47) times higher than the others (P=0.048). The prevalence of amblyopia was more in participants with unilateral ptosis (23.5%) that those with bilateral ptosis (17.6%). The difference was statistically significant (P<0.001).

The mean amount of cylinder power in ptosis and non-ptosis cases were  $0.97 \pm 0.97$  diopters (D) and  $0.59 \pm 0.74$  D, respectively; this difference was statistically significant (P=0.006).

The association between astigmatism and ptosis remained statistically significant in a multiple models with adjustment for cataract and history of cataract surgery variable

(P=0.029). Although with the rule astigmatism was a little more prevalent in those participants with ptosis but from statistical point of view, the type of astigmatism was not different between ptotic and non-ptotic

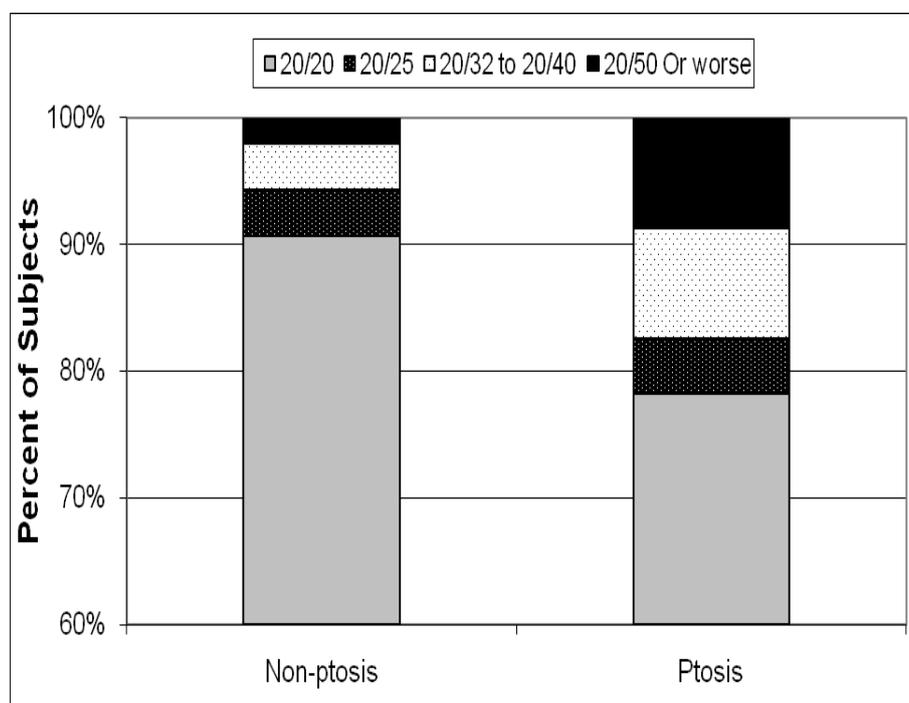
participants (P=0.150). The prevalence of ptosis was 4.1% and 0.8% in participants with and without a history of cataract surgery, respectively (P<0.001).

**Table 1.** Prevalence of ptosis by age and gender

	N	Unilateral	Bilateral	Total
		% (95% CI)	% (95% CI)	% (95% CI)
<b>Age (years)</b>				
1-19	1716	0.29 (0.03-0.55)	0.49 (0.1-0.87)	0.78 (0.32-1.24)
20-39	1415	0.30 (0.07-0.64)*	0.41 (0.04-0.78)	0.71 (0.21-1.21)
40-59	1048	0.93 (0.25-1.62)	0.22 (0.12-0.55)*	1.16 (0.41-1.91)
≥60	387	0.71 (0.1-1.53) *	1.15 (0.14-2.16)	1.87 (0.58-3.16)
<b>Gender</b>				
Male	1909	0.67 (0.29-1.06)	0.60 (0.22-0.98)	1.28 (0.74-1.81)
Female	2656	0.19 (0.03-0.34)	0.32 (0.07-0.56)	0.50 (0.22-0.79)
<b>Total</b>	4565	0.44 (0.21-0.66)	0.46 (0.23-0.69)	0.90 (0.58-1.21)

CI: Confidence interval

\*: The confidence interval was calculated by binomial distribution.



**Figure 1.** Comparison of best corrected visual acuity in ptotic and non-ptotic participants without cataract

## Discussion

In this part of the TES, we assessed the prevalence of ptosis and its association with vision-related variables. Some limitations should be considered in this study. Firstly, the type and severity of ptosis was not determined, so associations should be interpreted with caution. Secondly, the history of ptosis surgery was not assessed in this study and this would cause an underestimation of the true prevalence rates. However, it should be noted that this report is one of the few studies which provides ophthalmologists with valuable information about ptosis in a general population. The paucity of similar reports also limits our ability to compare our results in Tehran with other regions of the world. Sridharan et al<sup>4</sup> reported a ptosis prevalence rate of 11.5% in the over 50 year old population. According to our results, the prevalence in this age group was much lower in Tehran.

The prevalence of ptosis was shown to increase by age which confirms the findings by Sridharan et al.<sup>4</sup> Although a percentage of ptotic cases are congenital, studies have shown that regardless of this point, aging is a factor that increases its prevalence. This is primarily attributed to age per se, as indicated by other reports,<sup>1,6</sup> and other causes such as cataract surgery which is usually done at older

ages. The use of speculum during cataract surgery may disrupt the integrity of the levator muscle,<sup>1,7,8</sup> and our finding demonstrated 1.5 times higher odds of ptosis in patients with a history of cataract surgery compared to without such history.

In this study, the odds of amblyopia was 3.24 times higher in ptotic cases than in others. As mentioned before, amblyopia is one of the major complications of ptosis and several studies have emphasized ptosis mostly because of its subsequent amblyopia.<sup>1,3,9,10</sup> The primary reason is the obstruction of the visual pathway. Amblyopia has also been attributed to the astigmatism caused by ptosis. Our findings indicted significantly higher amounts of astigmatism in ptotic cases which may be due to the weight of the eyelid pressing on the cornea and changing its curvature.

## Conclusion

According to this study, the prevalence of ptosis in Tehran's population was low and more common in men than in women. Age was associated with ptosis. Similar to some other published studies, we found that amblyopia is the most prevalent visual impairment associated with ptosis.

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