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Original research

The prevalence of ptosis in an Iranian adult population

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Abstract

Purpose: To determine upper eyelid ptosis prevalence and some related factors in 44- to 69-year-olds of Shahroud in the north of Iran.
Methods: In 2009, using multi-stage cluster sampling, 300 clusters of 40–64-year-olds were selected in Shahroud city, and all 5190 participants were invited to be re-examined in 5 years (2014). The current report is the second phase of the study in which 4737 (91.3%) people participated and underwent vision tests, slit lamp examination, biometry, and ophthalmoscopy in 2014. Upper eyelid ptosis was determined by an ophthalmologist.
Results: The prevalence of upper eyelid ptosis was 4.7% [95% confidence interval (CI): 4.1–5.4]; 5.2% in women and in 4.0% in men. The prevalence of bilateral and unilateral ptosis was 1.3% (95% CI: 1.0–1.7) and 3.4% (95% CI: 2.8–4.0), respectively. The observed prevalence of ptosis was 3.1% in the 45- to 49-year age group and 5.8% in 65- to 69-year-olds. The prevalence of ptosis increased with age. In the multiple logistic regression model, ptosis prevalence correlated with older age, diabetes (odds ratio = 1.53, 95% CI: 1.16–2.02) and hypertension (odds ratio = 1.41, 95% CI: 1.03–2.92). Mean corneal astigmatism was 1.02 (95%C]: 0.87–1.18) diopter in ptotic eyes and 0.87 (95% CI: 0.84–0.89) diopter in non-ptotic eyes ($p = 0.013$).
Conclusions: The present report provides valuable information on the prevalence of ptosis in a population of 45-to 69-year-olds. The prevalence of ptosis in this study was considerably high and significantly increased with age.

Keywords: Population based-study; Ptosis; Middle-east; Adult; Iran

Introduction

Ptosis is one of the problems of the upper eyelid which is seen in adults and children.[1] Since the pupillary axis can be blocked by drooping eyelids, it becomes associated with non-development of the visual system in children and can lead to amblyopia by causing visual deprivation.[2,3] However, in adults, in addition to cosmetic issues, it can restrict the visual field and affect a person's daily activities and ultimately affect the patient's quality of life.[4,5] In children, most cases of ptosis

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are congenital; in adults, however, ptosis develops as a result of an abnormality in the levator aponeurosis like a tear, strain, or disinsertion. The demographic characteristics of these individuals have been studied in several case series which described a dominant hereditary transmission mode for the congenital type and the role of family history as well as its management, treatment, and surgery.[1,6,7] However, few population-based studies have studied the prevalence of ptosis, and the geographical distribution and epidemiology of this eye problem is not well known.[1,8,9] A review of previous studies shows that the prevalence of ptosis in children is under 1% and has been reported up to over 10% in the elderly.[8,9] Due to the lack of population-based studies on the prevalence of upper eyelid ptosis, here we aim to describe ptosis prevalence in a population of 45- to 69-year-olds.

Methods

The present report is part of the second phase of the Shahroud Eye Cohort Study. The prevalence of upper eyelid ptosis in this report is based on data from the second phase of this study which was conducted cross-sectionally in 2014.

The methodology and sampling approach of this study have already been published, and here we review it briefly.[10] In the first phase during 2009, using a multi-stage cluster sampling, 300 clusters of 40- to 64-year-olds in Shahroud city were selected. In each cluster, at least twenty 40- to 64-year-old individuals were selected for participation in the study, and they were invited for a thorough ophthalmic examination. In the first phase, 6311 people were selected, and 5190 (82.2%) participated in the study. In 2014, the second phase of this study was done. All participants of the first phase were invited to have eye examinations in the second phase, and 4737 (91.3%) participated. After obtaining informed consent, all respondents were first interviewed and tested for non-cycloplegic refraction using autorefraction with the Nidek ARK-510A. Then uncorrected visual acuity at near and far was measured, and autorefraction results were refined by an optometrist using the Heine Beta 200 retinoscope. Using the information obtained up to this stage, subjective refraction was done for those with vision worse than 20/20. In the next stage, slit lamp examination was performed by an ophthalmologist who also determined the presence or absence of upper eyelid ptosis. Ptosis was considered present when the upper lid laid more than 2 mm below the superior corneal limbus. We also used corneal astigmatism data extracted from ocular biometric examinations.

Statistical analysis

We determined the prevalence of unilateral and bilateral ptosis as well as ptosis in at least one eye along with 95% confidence intervals (CI). In calculating 95% CI and standard errors, the cluster sampling method was considered. To investigate relationships, *t*-test and logistic regression were used, and odds ratios (OR) were calculated.

Table 1
The prevalence of ptosis by age and gender in the 45- to 69-year-old population of Shahroud, Iran, 2014.

	Overall % (95%CI)	Bilateral % (95%CI)	Unilateral % (95%CI)
Age groups			
45–49	3.1 (1.9–4.3)	0.7 (0.1–1.2)	2.4 (1.3–3.5)
50–54	3.7 (2.5–4.9)	0.8 (0.3–1.3)	2.9 (1.9–4.0)
55–59	4.7 (3.5–6.0)	1.7 (1.0–2.4)	3.1 (2.1–4.0)
60–64	7.1 (5.3–8.9)	2.3 (1.3–3.3)	4.8 (3.3–6.3)
65–69	5.8 (3.9–7.7)	1.3 (0.4–2.3)	4.5 (2.8–6.2)
Male	4.0 (3.0–5.0)	1.2 (0.7–1.7)	2.7 (1.9–3.6)
Female	5.2 (4.4–6.1)	1.4 (1.0–1.9)	3.8 (3.1–4.6)
Total	4.7 (4.1–5.4)	1.3 (1.0–1.7)	3.4 (2.8–4.0)

[1] CI = confidence interval.

Ethical issues

The Ethics Committee of Shahroud University of Medical Sciences approved the study protocol, which was conducted in accord with the tenets of the Helsinki Declaration. All participants signed a written informed consent.

Results

In the second phase of the Shahroud Eye Cohort Study, which was conducted five years after the first phase, 453 of the original participants did not participate due to death, migration, or unwillingness, and eventually 4737 were studied; 58.9% (2791 people) of them were female. For 36 people, ptosis data was missing, and eventually, this report was prepared using data from 4701 people. The mean age of the study participants was 55.9 ± 6.2 years (44- to 69-year-olds).

The prevalence of ptosis was 4.7% (95%CI: 4.1–5.4); 27.7% of cases were bilateral. The prevalence of bilateral ptosis was 1.3% (95% CI: 1–1.7), and unilateral ptosis was 3.4 (95% CI: 2.8–4). Table 1 describes the prevalence of upper eyelid ptosis in men and women by age groups. The prevalence of ptosis was 5.2% in women and 4.0% in men ($p = 0.064$; OR = 1.33, 95% CI: 0.98–1.80).

As demonstrated in Table 1, the prevalence of ptosis significantly increased from 3.1% in the 45- to 49-year age group up to 7.1% in the 60- to 64-year-old age group, and then it reached 5.8% in the 65- to 69-year-old age group. The Chi 2 for trend test showed significant changes in the prevalence of ptosis in different age groups ($p < 0.001$). The prevalence of ptosis in patients with a history of intraocular surgery in this study was not significantly different from those without a history of eye surgery ($p = 0.678$).

In a multiple logistic regression model, the relationship of the variables of age, education, gender, hypertension, dyslipidemia, and diabetes was studied. The results of this model are summarized in Table 2. The 60- to 64-year age group had a higher prevalence of ptosis compared to 45- to 49-year-olds. Also, diabetes and hypertension were directly associated with the prevalence of ptosis.

Mean corneal astigmatism was 1.2 diopter (95% CI: 0.87–1.18) in ptotic eyes and 0.87 diopter (95% CI:

Table 2
Results of the multiple logistic regression model on the associations of ptosis with age and gender, diabetes, and hypertension.

	OR (95% confidence interval)	*p*-Value
Age groups		
45–49	1	–
50–54	1.17 (0.70–1.95)	0.542
55–59	1.44 (0.90–2.32)	0.130
60–64	2.15 (1.32–3.49)	0.002
65–69	1.65 (0.96–2.83)	0.071
Diabetes (yes/no)	1.53 (1.16–2.02)	0.003
Hypertension (yes/no)	1.41 (1.03–1.92)	0.031

OR: Odds ratio.

0.84–0.89) in non-ptotic cases, and the inter-group difference was statistically significant ($p = 0.013$). The prevalence of corneal astigmatism more than 1.0 diopter was 32.4% (95% CI: 24.5–40.3) and 28.5% (95% CI: 27.2–29.9) in ptotic and non-ptotic individuals, respectively ($p = 0.327$).

The prevalence of with-the-rule, against-the-rule, and oblique astigmatism was 20.4%, 7.0%, and 4.9%, respectively, in cases of ptosis, and 17.5%, 7.6%, and 3.4%, respectively, for non-ptotic cases.

Discussion

This study describes the prevalence of ptosis and some of its associated factors and provides valuable information regarding this eye problem in Iran. The prevalence of ptosis was 4.7%, and 1.3% of the cases had bilateral ptosis. The only study that has addressed ptosis prevalence in Iran is the Tehran Eye Study[9] which showed that the prevalence of ptosis in 40- to 59-year-olds was 1.16%, and this figure was 1.87% for over 60 year olds. As demonstrated in this study, ptosis prevalence is considerably higher than the Tehran Eye Study. Sridharan et al.[8] reported an 11.5% prevalence for ptosis in a sample of 400 adults over 50 years old in Manchester. Griepentrog et al.[1] also showed there is one case of congenital ptosis in every 842 births. In a 5-year study by Baiyeroju and Oluwatosin[11] in Nigeria, ptosis prevalence was reported 2.1%. In their study, 52% of patients were under 16 years old, and only 8% were over 50 years old. Due to the lack of population-based studies on the prevalence of ptosis, a comparison of results can be a little difficult; however it seems that the prevalence of ptosis in this study is not low. About 28% of ptosis cases in this study were bilateral. Results of other studies are not much different from ours, and most studies showed that 60–70% of ptosis cases are unilateral.[6,8] As the findings of this study indicated, the prevalence of ptosis significantly increased with age after the age of 60.[9] This finding has been shown in previous studies as well. Senile ptosis occurs due to an anomaly of the levator aponeurosis such as a tear, strain, or disinsertion as a result of aging. On the other hand, in the elderly, the levator muscle degeneration or thinning of aponeurosis with aging may lead to senile ptosis or involutional ptosis. However, ocular surgery such as cataract and glaucoma filtration surgery in older ages can cause acquired ptosis. However, in this study no statistically significant differences were observed between patients with and without a history of intraocular surgery. For this reason, it seems that a major part of the people in this study have involutional ptosis. As we observed, ptosis was less prevalent in the 65- to 69-year-old age group compared to the 60- to 64-year-olds. This is a little hard to justify; while the lower prevalence in this age group can be a coincidence, the age cohort effect on variations in ptosis prevalence should not be overlooked.

According to the multiple logistic regression model, in addition to age, diabetes and hypertension significantly correlated with the prevalence of ptosis; since age existed in the model, the effect of age is well controlled for. Few studies have examined the relationship between systemic diseases and ptosis. Bosco et al.[12] have discussed the relationship between diabetes and ptosis. In Korea, Moon and Lee demonstrated a higher prevalence of ptosis among diabetics. Although there was no association between dyslipidemia and the prevalence of ptosis in our study, Shirado[13] believes it is a possible determinant of age-related involutional ptosis. The relationship between diabetes and ptosis is due to a neurological disorder. Neurogenic ptosis is usually caused by oculomotor nerve paralysis or Horner's syndrome. Oculomotor nerve dysfunction may exist anywhere in its path from its beginning in the oculomotor nucleus in the midbrain to its peripheral innervations in extraocular muscles within the orbit.

We examined corneal astigmatism in ptotic and non-ptotic cases and found significantly higher degrees of corneal astigmatism in the former group. A report by Uğurbaş and Zilelioğlu[14] indicated that people with ptosis are more involved with astigmatism, and their topographic map is mostly bow tie. The main cause of astigmatism in these cases could be lid pressure and impact on corneal curvature. Also, as we demonstrated here as well, people with ptosis have with-the-rule astigmatism. This astigmatism is created due to lid pressure in the with-the-rule meridian. Therefore, astigmatism should be assessed for ptotic people who have not received refractive correction.

It should be noted that the present study has strong and weak points. The main strength of this study is presenting the prevalence of ptosis in the 44- to 69-year population and the high sample size; however, the lack of classification of the causes of the type of ptosis appearance is one of the weak points of this study that should be noted. Due to the age distribution of the participants, we cannot consider most of them to be congenital, and a portion of ptosis cases in this study is acquired. Another limitation was that we did not have specific exclusion criteria for assessing ptosis and so some patients may have had external ocular surgery including lid and ocular muscle surgery that could change the results and the estimated prevalences.

In conclusion, through the present report, valuable information regarding the prevalence of ptosis in a population of 45- to 69-year-olds is provided. The prevalence of ptosis in this study was considerably high and significantly increased with age. Diabetes and high blood pressure were among systemic diseases directly related to the prevalence of ptosis in this study. Astigmatism degree was significantly higher in

ptosis eyes, thus, attention to this point, especially for cataract surgery and intraocular lens calculation for these cases, is very important.

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