Original Article

Prevalence and demographic characteristics of strabismus in adults

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ABSTRACT

Background: Strabismus is a common ocular disorder and a major cause of visual impairment and amblyopia. Its prevalence varies widely across populations and may differ by age, ethnicity, and underlying risk factors. Despite its clinical and psychosocial impact, data on strabismus in Iranian adults remain limited. This study aimed to determine the prevalence of strabismus and its associated demographic factors in southeastern Iran.

Methods: This cross-sectional analysis used baseline data from an adult eye cohort in Zahedan, southeastern Iran. A stratified cluster sampling design, based on socioeconomic status, was used to recruit residents aged 35–70 years between 2015 and 2019. Of 10 016 screened individuals, 9296 met inclusion criteria of Iranian nationality, ≥ 9 months of local residency, and completion of baseline assessments; participants with prior ocular surgery or active ocular disease were excluded. All participants completed a standardized ocular history questionnaire and underwent comprehensive visual assessment, including Snellen visual acuity testing, objective and subjective non-cycloplegic refraction, automated lensometry for habitual correction, external examination, slit-lamp biomicroscopy, and Goldmann applanation tonometry. Ocular alignment was evaluated using cover-uncover and alternate cover tests at distance and near vision. Strabismus was classified based on manifest deviations detected under best correction.

Results: Among 9296 adults, the overall prevalence of strabismus was 2.8% (262 cases; 95% CI: 2.5–3.2). The prevalences of exotropia, esotropia, hypertropia, intermittent exotropia, and intermittent esotropia were 1.3% (129 cases, 95% CI: 0.00–3.20), 0.2% (18 cases, 95% CI: 0.00–2.20), 0.3% (26 cases, 95% CI: 0.00–2.40), 0.8% (77 cases, 95% CI: 0.00–2.70), and 0.1% (12 cases, 95% CI: 0.00–1.80), respectively. Strabismus occurred most frequently in the 45–54-years age group (n = 92, 35.1%) and least often in those aged 65–75 years (n = 14, 8.3%). Women accounted for 61.8% (n = 162) of all cases, with all subtypes more common in women except for esotropia, which was equally distributed. Strabismus was most frequent among individuals with high school education (n = 89, 34.0%) and least common in those with university degrees (n = 46, 17.6%). The Sistani ethnic group showed the highest prevalence (n = 141, 53.8%) across all subtypes.

Conclusions: Strabismus affected 2.8% of adults, with exotropia the most common subtype. Prevalence varied by age, sex, educational level, and ethnicity, with the highest burden in adults aged 45–54 years and among the Sistani group. Most cases were previously undiagnosed, underscoring the need for targeted screening and early detection. Ongoing longitudinal follow-up will clarify incidence, progression, and treatment outcomes, supporting improved clinical decision-making, resource allocation, and long-term visual outcomes.

KEYWORDS

squint, convergent strabismus, divergent strabismus, esodeviation, exodeviation, adults, cohort study, prevalences

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How to cite this article: Shahraki K, Tahkor A, Shahraki-Sanavi F, Shahraki K, Okati-Aliabad H, Mohammadi M, Ansari-Moghaddam A. Prevalence and demographic characteristics of strabismus in adults. Med Hypothesis Discov Innov Optom. 2025 Fall; 6(3): 112-120. DOI: https://doi.org/10.51329/mehdioptometry230.

Received: 07 March 2025; Accepted: 10 September 2025

INTRODUCTION

Strabismus is an important ophthalmic disorder, a common ocular condition in childhood, and one of the leading causes of poor vision and amblyopia [1–3]. It is characterized by a deviation of the visual axes in which one eye turns inward, outward, upward, or downward and becomes displaced from the point of fixation [4]. Such deviations may occur in any direction, may be constant or intermittent, and can affect both distance and near vision [4, 5].

Multiple factors may predispose individuals to strabismus, including congenital and hereditary conditions, Mobius syndrome, increased accommodation or convergence leading to esotropia, decreased accommodation or convergence in myopia resulting in exotropia, injury to extraocular nerves or muscles, maternal drug exposure, and other disorders affecting brain function, such as cerebral palsy, Down syndrome, hydrocephalus, brain tumors, and prematurity [4, 6]. Beyond its clinical significance, strabismus is also associated with an elevated risk of psychological, emotional, and social difficulties, which may manifest as depression, anxiety, and impaired social interactions [4, 7, 8].

The prevalence and incidence of strabismus vary worldwide, also within Iran [9–32], with differing rates reported across populations [3, 5, 10, 33–36]. Although esotropia is generally the most common form in most ethnic groups [4, 37], exotropia occurs more frequently than esotropia in certain populations [36, 38], highlighting the need for population- and ethnicity-specific prevalence data.

While such epidemiological investigations are valuable for guiding screening strategies and reducing strabismus-related complications, the condition should also be considered in adults due to its potential association with aging. Studies of this nature facilitate informed clinical decision-making regarding strabismus and other vision disorders that may require surgical or medical intervention. Given the paucity of data on the adult population in Iran, the present study was conducted to determine the prevalence of strabismus and its associated demographic factors in southeastern Iran.

METHODS

The present cross-sectional study utilized baseline data of adults from the PERSIAN Eye Cohort [39] conducted in Zahedan, located in the Sistan and Baluchestan province of southeastern Iran. A total of 10 016 potentially eligible individuals aged 35–70 years residing in the study area were recruited between October 2015 and January 2019. The cohort study received national approval (Grant 700/534) and was endorsed by Zahedan University of Medical Sciences (Grant 93-4-96451). The present investigation was conducted in accordance with the ethical standards outlined in code IR.ZAUMS.REC.1402.107. Written informed consent was obtained from all participants, each of whom was informed of their right to withdraw from the study at any time. Participant data were recorded using unique study identifiers, and strict confidentiality was maintained throughout all stages of the research.

A representative sample of the target population was obtained using a stratified cluster sampling approach, with socioeconomic status serving as the stratifying variable [40, 41]. Initially, several meetings were held with medical experts and public service agencies to categorize areas of Zahedan by socioeconomic status. Next, one district was randomly selected from each of the low, medium, and high socioeconomic strata. All eligible residents within these selected districts were then invited to participate in the study.

Inclusion criteria comprised Iranian nationality, age between 35 and 70 years at the baseline survey, residency in Zahedan for at least nine months, and completion of the baseline survey to enable follow-up assessments. Individuals who did not meet these criteria or who had severe physical or mental illnesses that prevented completion of the questionnaire or attendance at the cohort center [39, 42] were excluded (n = 9, 0.1%). Additionally, participants with a history of eye surgery or active ocular disease were excluded (n = 711, 7.1%), resulting in a final screened cohort of 9296 subjects.

As part of the eye cohort study, participants completed a self-reported ocular history questionnaire that included information on diabetes, use of spectacles and/or contact lenses, ophthalmologist visits within the past year, dry eye–related symptoms, history of ocular surgery, amblyopia, and family history of glaucoma, retinal detachment, keratoconus, and night blindness. Visual acuity was assessed using a Snellen chart. For participants unable to read letters at a distance of 1 m, a finger-counting test was performed at various shorter distances. If the participant was unable to complete this test, hand movement perception was evaluated at a distance of 30 cm. Participants who still could not perceive hand movements underwent a light perception test, and visual acuity was recorded as "light perception"; if no light perception was detected, it was recorded accordingly.

All participants underwent objective, non-cycloplegic refraction using an autorefractor (NIDEK Auto Ref/Keratometer, Inc., Tokyo, Japan), with the spherical component (in diopters), cylindrical component (in diopter cylinder), and axis of the cylinder (in degrees) recorded for each eye. Additionally, manual objective refraction was performed using a handheld retinoscope (Hein Beta 200 Retinoskop, HEINE Optotechnic, Hersching, Germany) with trial lenses in a trial frame, and any signs of weak red reflex or convergence weakness were documented. For subjective refraction, the trial frame was placed on the participant's head, with the objective refraction results serving as a starting point. Sphere, cylinder, and axis of cylinder were refined using participants' responses to the dichromatic and cross-cylinder tests to determine best-corrected distance visual acuity, which was then recorded using individual lenses on the test glasses. For participants wearing habitual near or distance correction, the optical properties of their spectacles were measured using an automated lensometer (Auto Lensmeter LM-600PD, Nidek, Gamagori, Japan).

A comprehensive external ocular examination was first performed, including inspection of the eyelids and adnexa to detect any eyelid lesions or abnormalities. Pupillary evaluation followed, with specific assessment for pupillary abnormalities and relative afferent pupillary defects [43, 44]. A detailed slit-lamp biomicroscopic examination (SL-D7, Topcon Corporation, Tokyo, Japan) was then conducted for all participants. After instilling topical anesthetic and applying a fluorescein dry strip, intraocular pressure (IOP) was measured in both eyes using a Goldmann applanation tonometer (AT900, Haag-Streit, Koeniz, Switzerland). IOP measurements exceeding 20 mmHg were repeated to ensure reliability. Ocular alignment was subsequently assessed. The cover-uncover and alternate cover tests were performed at distance and near fixation to detect tropias and quantify heterophoria [45]. Testing was performed under best optical correction, with appropriate additional near lenses for presbyopic participants. Each eye was also evaluated individually for the presence of nystagmus. The fixation target consisted of a single Snellen letter (distance or near) presented at one line above the best-corrected visual acuity of the poorer-seeing eye. Participants unable to complete cover testing due to poor cooperation were excluded. For consistency with previous literature, tropia (including exotropia, esotropia, hypertropia, and hypotropia) was defined as a constant unilateral or alternating horizontal or vertical strabismus observed at either distance or near fixation distances [46, 47].

The data were entered into Microsoft Excel and subsequently imported into IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA) for analysis. Descriptive statistics were used to characterize the study population and to quantify the distribution of strabismus and its subtypes. Normality of continuous variables was assessed using the Shapiro–Wilk test. Categorical variables, including prevalence and demographic frequencies, were summarized as counts and percentages, with prevalence estimates accompanied by 95% confidence intervals (95% CI). Continuous variables, such as spherical equivalent and age, were expressed as mean (standard deviation [SD]). All analyses were descriptive, and no inferential hypothesis testing was performed.

RESULTS

A total of 10 016 individuals aged 35–75 years participated in the study. After excluding 720 participants, the final analytic sample comprised 9296 individuals. Mean (SD) age of the included participants was 55.14 (1.52) years, and the majority were women (n = 5708, 61.4%). In the overall population, the mean (SD) spherical equivalent refractive error for the right and left eyes was 0.08 (1.61) diopters and 0.08 (1.53) diopters, respectively.

As summarized in Table 1, the prevalence of exotropia, esotropia, hypertropia, intermittent exotropia, and intermittent esotropia was 1.3% (95% CI: 0.00–3.20), 0.2% (95% CI: 0.00–2.20), 0.3% (95% CI: 0.00–2.40), 0.8% (95% CI: 0.00–2.70), and 0.1% (95% CI: 0.00–1.80), respectively. The overall prevalence of strabismus was 2.8% (262 cases; 95% CI: 2.5–3.2). Among participants diagnosed with strabismus, the highest proportions of exotropia, esotropia, hypertropia, intermittent exotropia, and intermittent esotropia were observed in the 45–54 (n = 47, 36.4%), 55–64 (n = 8, 44.4%), 35–44 (n = 10, 38.5%), 45–54 (n = 29, 37.7%), and 55–64 (n = 5, 41.7%) years age groups, respectively. Across all strabismus subtypes, the lowest frequencies were consistently observed in the 65–75 years age group. Overall, of the 262 individuals with strabismus, the highest and lowest frequencies were observed in the 45–54 (n = 92, 35.1%) and 65–75 (n = 14, 5.3%) years age groups, respectively (Table 2).

Across all strabismus subtypes, the highest frequencies were consistently observed in women, with the exception of esotropia, which was equally distributed between the sexes. The overall highest frequency of strabismus was detected in women (n = 162, 61.8%) (Table 2). Stratified by educational level, the highest frequency of strabismus was observed among participants with high school education (n = 89, 34.0%) and the lowest among those with university degrees (n = 46, 17.6%). Specifically, the highest frequency of exotropia (n = 44, 34.1%), hypertropia (n = 8, 30.8%), intermittent exotropia (n = 25, 32.5%), and intermittent esotropia (n = 4, 33.3%) occurred in participants with high school education, whereas esotropia showed the highest frequency among both illiterate participants and those with high school education (n = 8, 44.4% in each group) (Table 2).

Regarding ethnicity, the highest prevalence of strabismus was observed among the Sistani group (n = 141, 53.8%), followed by the Baloch (n = 62, 23.7%) and other ethnicities (n = 59, 22.5%). Across all strabismus subtypes, the Sistani ethnic group consistently displayed the highest frequencies (Table 2).

Table 1. Prevalence of strabismus subtypes and associated demographic characteristics among study participants

Variable	Exotropia (n = 129)	Esotropia (n =18)	Hypertropia (n = 26)	Intermittent exotropia (n = 77)	Intermittent esotropia (n = 12)	Total (n = 262)
Age (y), Mean ± SD	52.4 ± 10.2	54.1 ± 9.8	51.8 ± 11.3	53.6 ± 10.5	55.2 ± 8.9	53.1 ± 10.4
Sex (Male / Female), n (%)	47 (36.4) / 82 (63.6)	9 (50.0) /9 (50.0)	8 (30. 8) / 18 (69.2)	31 (40.3) / 46 (59.7)	5 (41.7) / 7 (58.3)	100 (38.2) / 162 (61.8)
Ethnicity (Sistani / Baloch / Others), n (%)	67 (51.9) / 32 (24.8) / 30 (23.3)	11 (61.1) / 6 (33.3) / 1 (5.6)	12 (46.2) / 6 (23.0) / 8 (30.8)	44 (57.1) / 14 (18.2) / 19 (24.7)	7 (58.3) / 4 (33.3) / 1 (8.3)	141 (53.8) / 62 (23.7) / 59 (22.5)
Prevalence (%) (95% CI)	1.3 (0.00 – 3.20)	0.2 (0.00 – 2.20)	0.3 (0.00 – 2.40)	0.8 (0.00 – 2.70)	0.1 (0.00 – 1.80)	2.8% (2.5 – 3.2)

Abbreviations: n, number; y, years; SD, standard deviation; %, percentage; CI, confidence interval.

Table 2. Stratified demographic frequencies of strabismus and its subtypes

Variable	Exotropia, n (%)	Esotropia, n (%)	Hypertropia, n (%)	Intermittent Exotropia, n (%)	Intermittent Esotropia, n (%)	Total, n (%)
Age						
35–44y	36 (27.9)	2 (11.1)	10 (38.5)	20 (26.0)	2 (16.7)	70 (26.7)
45–54y	47 (36.4)	7 (38.9)	5 (19.2)	29 (37.7)	4 (33.3)	92 (35.1)
55–64y	40 (31.0)	8 (44.4)	9 (34.6)	24 (31.2)	5 (41.7)	86 (32.8)
65–75y	6 (4.7)	1 (5.6)	2 (7.7)	4 (5.2)	1 (8.3)	14 (5.3)
Sex						
Men	47 (36.4)	9 (50.0)	8 (30.8)	31 (40.3)	5 (41.7)	100 (38.2)
Women	82 (63.6)	9 (50.0)	18 (69.2)	46 (59.7)	7 (58.3)	162 (61.8)
Educational level						
Illiterate	34 (26.4)	8 (44.4)	6 (23.1)	22 (28.6)	3 (25.0)	73 (27.9)
Elementary	26 (20.2)	1 (5.6)	7 (26.9)	18 (23.4)	2 (16.7)	54 (20.6)
High School	44 (34.1)	8 (44.4)	8 (30.8)	25 (32.5)	4 (33.3)	89 (34.0)
University	25 (19.4)	1 (5.6)	5 (19.2)	12 (15.6)	3 (25.0r5)	46 (17.6)
Ethnicity						
Sistani	67 (51.9)	11 (61.1)	12 (46.2)	44 (57.1)	7 (58.3)	141 (53.8)
Baloch	32 (24.8)	6 (33.3)	6 (23.1)	14 (18.2)	4 (33.3)	62 (23.7)
Other	30 (23.3)	1 (5.6)	8 (30.8)	19 (24.7)	1 (8.3)	59 (22.5)
Total	129 (100.0)	18 (100.0)	26 (100.0)	77 (100.0)	12 (100.0)	262 (100.0)

Abbreviations: n, number; %, percentage.

DISSCUSSION

In this study, 9296 participants aged 35–70 years were surveyed to determine the prevalence of strabismus. Because this is a large population-based study of eye diseases, it provides robust estimates of the overall prevalence of strabismus in the Baloch and Sistani ethnic groups by age and sex. The overall prevalence of strabismus was 2.8% (262 cases; 95% CI: 2.5–3.2).

Previous reports show considerable variability depending on age and population characteristics, with estimates ranging from 0.8% in a rural cohort of Indian children [48] to approximately 2%–5% in the general population [4]. The prevalence observed in our study was relatively lower than that reported in most previous studies conducted in Iran [26, 27, 30]. One possible explanation is the age distribution of our participants, as most earlier investigations focused on children and younger individuals [9, 27], and only a few included all age groups [26, 49]. According to current literature, the prevalence of strabismus is 0.80% in Singaporean children aged 6–72 months [13], 2.4% in Hispanic/Latino children [14], 2.5% in African-American children [14], 1.28% in Japanese primary school-aged children 6–12 years (with exotropia and esotropia accounting for 0.69% and 0.28%, respectively) [36], 2.02% in 12.5-year-old Iranian children [27], 1.68% in Iranian seven-year-olds [9], 4.3% in rural Iranian populations [26], 2.8% in Australian six-year-olds [3], 2.3% in English seven-year-olds [50], 4.3% in Canadian children with a mean age of 4.2 years [51], 1.2% in a population-based study of Iranian six-year-olds [52], and 0.81% in a population-based study of children aged 1–12 years in southeastern Brazil [53].

Differences in strabismus prevalence across studies, including ours, likely reflect variation in study design. Many investigations relied on school-based, non-random sampling due to the accessibility of these populations [3, 9, 11, 13, 21, 27, 28, 30, 31, 36, 51, 54–57]. Sample size is another important factor; the present study included a larger sample than most previous studies [26, 27, 29, 58]. Earlier evidence suggests that manifest strabismus tends to appear less frequently in larger population samples [52, 53, 59], although this trend does not apply to heterophoria [60]. It should also be noted that many earlier studies cannot be generalized to the Iranian adult population due to their small sample sizes and narrow age ranges. The present study was designed to address this limitation.

The prevalence of strabismus observed in the present study is comparable to that reported in low-income and lower-middle-income countries, yet lower than estimates from high-income nations [22, 48, 53, 55, 56, 61]. A plausible explanation for the higher prevalence documented in high-income settings is the substantially greater survival rate of low birthweight and premature infants. Advances in neonatal care in these countries raise the survival of premature infants—who are at elevated risk for strabismus—thereby contributing to the higher prevalence reported in these populations [62, 63].

Another explanation for the observed variation in strabismus prevalence across studies is the use of differing diagnostic criteria and measurement techniques. Some investigations, including the present one, assessed only manifest strabismus, whereas others included eyes with heterophoria [9, 11, 14, 15, 26, 45, 52, 64, 65]. Diagnostic tests used to quantify ocular deviation likewise vary across studies. Several investigations, similar to ours employed unilateral and alternating cover tests [26, 58, 59], whereas others relied on the Hirschberg test [66] or used a combination of cover testing with corneal light-reflex assessment, with the magnitude of deviation quantified using the Hirschberg method [67].

In a population-based cohort of 3785 Danish adults, the overall prevalence of strabismus was reported at 1.1% (95% CI: 0.8–1.5), with no significant differences detected by sex or screening status. Within that population, exotropia and esotropia were identified in 0.3% (95% CI: 0.2–0.6) and 0.8% (95% CI: 0.5–1.1) of individuals, respectively, and no vertical deviations were observed [66]. By comparison, in our cohort the prevalence of exotropia, esotropia, and hypertropia was 1.3% (95% CI: 0.00–3.20), 0.2% (95% CI: 0.00–2.20), and 0.3% (95% CI: 0.00–2.40), respectively. Exotropia emerged as the most common horizontal deviation—an observation aligned with several previous reports from Iran. For instance, in a study of 2638 schoolchildren (mean age 12.5 years), exotropia and esotropia were observed in 1.30% and 0.59% of participants, respectively [27]. Similarly, another investigation of 1130 schoolchildren found a strabismus prevalence of 1.9% (95% CI: 0.2–3.8), with 63.6% of cases classified as exotropic and 36.4% as esotropic [28]. Conversely, some Iranian studies have reported higher overall prevalence rates and differing subtype distributions; one such study documented a strabismus prevalence of 3.1% (95% CI: 1.3–4.3), with significantly higher rates in girls (4.2%) than in boys (2.0%) [11]. These discrepancies reflect the complex interplay of genetic, environmental, and population-specific factors that shape the epidemiology of strabismus. Consistent with global trends, exotropia tends to predominate in many Asian populations [36, 47, 68, 69] and among individuals of African descent [14], whereas esotropia is more frequently reported in European and Western cohorts [25, 33, 71]. Nonetheless, this pattern is not universal: some studies from Iran [70] and Saudi Arabia [18] have documented a higher prevalence of esotropia, highlighting the regional variability in ocular alignment disorders. Such variation underscores the importance of local epidemiologic data to inform clinical practice, screening strategies, and research priorities. Age is another important factor, as many earlier investigations focused on school-aged children [68, 70], who may not be representative of the general population.

The ratio of exotropia to esotropia in our cohort was 6.5:1. By contrast, a population-based study of Danish adults reported a ratio of 1:2.7, indicating a predominance of esotropia [66]. In pediatric cohorts, ratios of 1.5:1, 9.75:1, and 7:1 have been documented among Asian children [15], Hong Kong children [72], and Singaporean children [13], respectively. The distribution of strabismus types is strongly influenced by the pattern of comorbid refractive error. Exotropia is more commonly associated with myopia, whereas esotropia frequently accompanies hyperopia [46]. Accordingly, the comparatively higher prevalence of exotropia observed in our study may be attributable to the elevated prevalence of myopia within this cohort [42].

A 2016 meta-analysis comprising 23541 participants identified myopia as a significant risk factor for exotropia (odds ratio 5.23), proposing that impaired fusion control at distance arises from delayed accommodation in myopic individuals, thereby reducing accommodative effort [73]. This diminished accommodative drive results in reduced accommodative convergence, and chronic under-engagement of convergence mechanisms is believed to contribute to loss of fusion control, ultimately predisposing individuals to exotropia [74]. Beyond refractive status, several additional independent factors—including perinatal exposure to smoking, maternal age, race, and genetic susceptibility—have been implicated in shaping the epidemiology of tropias [71, 75, 76].

In our cohort, strabismus was more frequently observed in women (61.4%) than in men (36.6%), with women comprising 58.3% of the overall strabismus group. However, evidence from large-scale studies does not support a true sex-based difference in strabismus prevalence. A recent systematic review and meta-analysis by Laughton et al. that synthesized data from 73 population-based and 141 clinic-based studies reported nearly identical prevalence estimates for horizontal strabismus (2.558% in males vs. 2.582% in females), esotropia (1.386% vs. 1.377%), and exotropia (1.035% vs. 1.043%) [71]. Consequently, the higher proportion of women with strabismus in our sample is likely attributable to the overrepresentation of women in the study population. We also observed that esotropia occurred more frequently among participants with university or elementary education levels compared with other educational strata. Regarding ethnic variation, the prevalence of strabismus among affected individuals in the Sistani, Baloch, and Fars groups was 50.3%, 28.6%, and 21.1%, respectively. These apparent differences are likely driven by the unequal distribution of ethnic groups within the study: the Sistani population was disproportionately represented, with 5021 participants contributing to the sample.

This study possesses several important strengths. Foremost, its large, population-based sample enhances statistical power and supports the generalizability of the findings to the wider community. The use of a standardized, protocol-driven ophthalmic examination minimized inter-examiner variability and reduced the likelihood of measurement error, thereby strengthening the internal validity of the results. An additional advantage of this cohort is its longitudinal design, which will allow future assessments of temporal changes in strabismus prevalence, natural history, and associated risk factors as subsequent waves of data become available from this ongoing study. Nonetheless, several limitations should be acknowledged. Although we identified numerous previously undiagnosed cases of strabismus, individuals with a prior diagnosis or successful treatment from external providers may have been underrepresented. This potential under-ascertainment could result in a modest underestimation of prevalence. Moreover, some individuals referred for ophthalmic examination declined participation, introducing a possible nonresponse bias; however, we consider it unlikely for this to have materially influenced the overall results. Future research would benefit from the integration of comprehensive ophthalmic records from external clinics, detailed biometric measurements, and extensive environmental and genetic data to further clarify the multifactorial etiology of strabismus. Continued longitudinal follow-up of this cohort is expected to yield valuable insights into incidence patterns, treatment outcomes, and the dynamic interplay between refractive error development and ocular alignment over time.

CONCLUSIONS

This large population-based study provides an updated assessment of strabismus in adults aged 35–75 years. Among 9296 participants, the overall prevalence was 2.8%, with exotropia as the most common subtype (1.3%), followed by hypertropia (0.3%) and esotropia (0.2%). Intermittent exotropia (0.8%) was more frequent than intermittent esotropia (0.1%). Strabismus was most common in adults aged 45–54 years and least common in those aged 65–75 years. Women accounted for 61.8% of cases, reflecting the cohort's demographic structure. Considering educational and ethnic patterns, individuals with high school education showed the highest strabismus frequency, and the Sistani group had the greatest burden (53.8%). These findings highlight substantial variation across demographic, educational, and ethnic groups and emphasize the value of targeted screening, particularly as most cases were previously undiagnosed. The longitudinal follow-up of this cohort will provide essential evidence on incidence, progression, and treatment outcomes, informing clinical decision-making, referral pathways, and health-system planning. Ultimately, these insights may support more effective resource allocation and improved visual and functional outcomes for adults with strabismus.

ETHICAL DECLARATIONS

Ethical approval: The cohort study received national approval (Grant 700/534) and was endorsed by Zahedan University of Medical Sciences (Grant 93-4-96451). The present investigation was conducted in accordance with the ethical standards outlined in code IR.ZAUMS.REC.1402.107. Written informed consent was obtained from all participants, each of whom was informed of their right to withdraw from the study at any time. Participant data were recorded using unique study identifiers, and strict confidentiality was maintained throughout all stages of the research.

Conflict of interests: None.

FUNDING

None.

ACKNOWLEDGMENTS

We gratefully acknowledge the financial support of the Ministry of Health and Medical Education of Iran and the Vice-Chancellor for Research and Technology at Zahedan University of Medical Sciences, whose contributions were instrumental to this study. We also extend our sincere appreciation to the residents of Zahedan for their cooperation and participation, without whom this research would not have been possible.

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