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### **FREQUENCY OF REFERRALS AND CLINICAL PROFILE OF CHILDREN WITH STRABISMUS AT THE TERTIARY LEVEL OF OPHTHALMOLOGICAL CARE IN AZERBAIJAN**

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The highest frequency of referrals was observed among children aged 5–9 years (94.0±3.8 per 100,000). The second highest frequency was in children aged 0–4 years (85.9±3.9 per 100,000). A comparatively lower frequency of referrals was found in children aged 10–14 years (80.2±3.3 per 100,000). The frequency of hospitalization of children at the tertiary level for surgical treatment of strabismus was relatively low. In the 0–4 and 10–14 age groups, the hospitalization rates were almost the same, while in the 5–9 age group they were nearly twice as high. Despite the high level of primary referrals of children with strabismus to tertiary ophthalmological care (86.4±2.1 per 100,000 children), the frequency of hospitalization for surgical treatment was significantly lower (7.3±1.2 per 100,000 children). Referrals and hospitalizations of children with strabismus at the tertiary level are significantly higher in the 5–9 age group, with a persistent gender difference (male patients predominate). The clinical profile of patients with strabismus does not change significantly depending on age. The most characteristic features of the clinical profile are the type of strabismus, the age of diagnosis, and the probability of risk factors for strabismus.

**Key words:** strabismus, children, frequency of referrals, tertiary ophthalmological care, surgical treatment.

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### **ЧАСТОТА ЗВЕРНЕНЬ ТА КЛІНІЧНИЙ ПРОФІЛЬ ДІТЕЙ З КОСООКІСТЮ НА ТРЕТЬОМУ ЕТАПІ ОФТАЛЬМОЛОГІЧНОЇ ДОПОМОГИ В АЗЕРБАЙДЖАНІ**

Найбільша частота звернень спостерігалася в дітей віком 5–9 років (94,0±3,8 на 100 тис.). Друге місце за частотою звернень займають діти віком 0,4 років (85,9±3,9 на 100 тис.). Порівняно менша частота звернень спостерігається серед дітей віком 10–14 років (80,2±3,3 на 100 тис.). Порівняно низька частота госпіталізації дітей третьому етапі для хірургічного лікування косоокості. У віці 0,4 та 10–14 років частота госпіталізації практично однакова, лише у віковій групі 5–9 років вона на 2 рази вища. За високого рівня первинного поводження дітей із косоокістю на третинному етапі офтальмологічної допомоги (86,4±2,1 на 100 тис. дитячого населення) спостерігається значно низька частота госпіталізації для хірургічного лікування (7,3±1,2 на 100 тис. звернень). Звернення та госпіталізації дітей з косоокістю на третинному етапі суттєво більше у віці 5–9 років, зберігається гендерна відмінність (серед пацієнтів переважають хлопчики). Клінічний профіль хворих з косоокістю суттєво не змінюється залежно від віку. Найбільш характерними особливостями клінічного профілю пацієнтів є тип косоокості, вік під час діагностики та ймовірність наявності факторів ризику розвитку косоокості.

**Ключові слова:** косоокість, діти, частота звернень, третинний рівень офтальмологічної допомоги, хірургічне лікування.

Diseases of the eye muscles and disorders of friendly eye movement, combining various forms of strabismus, are common pathologies all over the world [12]. Premature infants have a significantly high risk of strabismus [1]. The epidemiological

characteristics of strabismus have been studied quite well, and there are materials on its global and regional prevalence [12]. Methods of strabismus treatment have been developed and widely implemented [5]. Surgical methods for the treatment of strabismus are

especially widely used [3, 7]. It has been established that surgical treatment leads to improved maintenance of dynamic balance in children with strabismus [3]. Surgical tactics depend on the form of strabismus [4, 2, 11]. The effectiveness of the use of adjustable sutures in strabismus surgery has been shown [9]. Oculomotor muscle surgery is recommended for patients with monolateral friendly strabismus with intermittent central visual fixation of the eye. To address these issues, the clinical profile of patients is important [8, 10], which is insufficiently covered in the literature.

**The purpose** of the study was to establish the frequency of treatment and the clinical profile of children with strabismus at the third stage of ophthalmic care in Azerbaijan.

**Materials and methods.** The study was conducted on the basis of the National Center of Ophthalmology named after Academician Zarifa Aliyeva, which is a scientific and practical organization of the tertiary level in the ophthalmological service of the Republic of Azerbaijan. The materials of treatment and hospitalization of children with strabismus during 2020–2024 were used. The observation was conducted with continuous coverage, and exclusion criteria were not applied. The work was completed in stages. Initially, personal information was collected about each initial treatment of children diagnosed with strabismus at the center's polyclinic. The information included data on the demographic (gender, age) and clinical profile (clinical diagnosis, type of strabismus, age of occurrence, probable risk factors, and others) of patients. An expert assessment at the second stage of the study assessed the need for conservative or surgical treatment options. At the third stage, the demographic and clinical profile of patients hospitalized for surgical treatment were studied.

Statistical analysis of the materials was carried out using qualitative assessment methods, and the frequency of treatment and hospitalization per 100,000 children aged 0–4, 5–9, and 10–14 years was

determined. Information on the number of children was obtained from the database of the Azerbaijan State Statistics Committee ([www.gov.az.stat](http://www.gov.az.stat)). The clinical profile was assessed by analyzing extensive indicators, and the percentage of each feature characterizing the clinical profile was determined. Extensive and intensive indicators were compared using the chi-square criterion to assess the statistical significance of the difference [6]. Statistical data processing was performed using Microsoft Excel (Microsoft Corporation, USA) and IBM SPSS Statistics (IBM, USA). Critical values of statistical significance were assumed to be  $p \leq 0.05$ .

**Results of the study.** The frequency of visits of children with strabismus to the tertiary ophthalmic care center in Azerbaijan is shown in Table 1. The highest frequency of visits was observed in children aged 5–9 years ( $94.0 \pm 3.8$  per 100 thousand). The second place in terms of frequency of appeals is occupied by children aged 0–4 years ( $85.9 \pm 3.9$  per 100 thousand). A comparatively lower frequency of referrals is among children aged 10–14 years ( $80.2 \pm 3.3$  per 100 thousand). The difference in the frequency of appeals between the age groups is significant ( $p=0.05$ ). An expert assessment has shown that many of the children who applied need surgical treatment. A pair and group comparison showed that the frequency of strabismus requiring surgical correction did not change significantly with age ( $p>0.05$ ). It is recommended to plan  $42.5 \pm 1.5$  surgical treatment of strabismus per 100,000 children in Azerbaijan at the tertiary level, where there is a high-tech ophthalmological service. It is noteworthy that the overwhelming majority of those who applied and needed surgical correction of strabismus at the third stage did not consent to hospitalization. Therefore, the frequency of hospitalization of children at the third stage for surgical treatment of strabismus is relatively low. The frequency of hospitalization is almost the same at the ages of 0–4 and 10–14 years. Only in the age group of 5–9 years, it is up to 2 times higher ( $p=0.03$ ).

Table 1

**Frequency of treatment of children with strabismus at the third level of ophthalmological care in Azerbaijan (per 100,000 children of appropriate ages)**

Age, years	All requests	Requesting confirmation of the need for surgical correction	Treatment completed by surgical correction
0–4	$85.9 \pm 3.9$	$41.6 \pm 2.7$	$5.8 \pm 1.0$
5–9	$94.0 \pm 3.8$	$40.7 \pm 2.7$	$11.0 \pm 1.4$
10–14	$80.2 \pm 3.3$	$39.1 \pm 2.3$	$5.3 \pm 1.0$
All	$86.4 \pm 2.1$	$42.5 \pm 1.5$	$7.3 \pm 1.2$

The clinical and demographic characteristics of children who applied to the tertiary ophthalmology center with a diagnosis of strabismus are presented in Table 2.

Boys predominate among the children who applied in all age groups. The predominance of boys among children with strabismus is not associated with a higher level of pathology among them, as boys

significantly predominate among the child population in Azerbaijan.

Convergent concomitant strabismus occupies a leading place in the structure of clinical diagnoses. Most children developed strabismus at the ages of 4–12 and 13–24 months. According to anamnestic data, the probable risk factors for strabismus in 12.6 % and 14.7 % of cases were premature birth and a burdened family history (strabismus in parents).

The frequency of patients' visits to the tertiary stage for consultation and treatment has not been studied in practice. It has been established that in Azerbaijan, where children's services are insufficiently developed at the primary and secondary levels of ophthalmological care, 86.4±2.1 applications at the tertiary level with a diagnosis of strabismus are accounted for per 100 thousand children. Another feature attracts attention: about half

of those who applied at the tertiary stage need surgical treatment. However, most of them do not receive this treatment. As a result, there are 86.4±2.1 cases of strabismus per 100,000 children, 42.5±1.5 cases of necessary surgical treatment and 7.3±1.2 cases of hospitalization for operations. These data indicate the need to take measures to improve continuity in the system of step-by-step ophthalmological care for children.

Table 2

**Profile of children with strabismus at the third stage of ophthalmological care in Azerbaijan (percentage of total by age)**

Signs	Variants of signs	Age, years			
		0–4	5–9	10–14	All
Gender	Boys	58.4	62.8	62.2	61.3
	Girls	41.6	37.2	37.8	38.7
Diagnosis	Convergent concomitant strabismus	79.9	77.2	78.9	78.6
	Divergent concomitant strabismus	10.2	11.2	10.8	10.8
	Other	9.9	11.6	10.3	10.6
Types	Intermittent	77.4	71.7	73.2	73.8
	Neurological	9.3	11.9	11.3	11.0
	Infantile	7.3	8.8	8.1	8.0
	Restrictive	4.4	5.6	5.1	5.1
	Paralytic	1.9	2.0	2.3	2.1
Age of appearance (months)	0–3 months	7.0	8.8	8.1	8.0
	4–12 months	44.6	38.0	42.5	35.5
	13–24 months	39.3	34.7	32.8	41.3
	25–48 months	9.1	9.6	6.4	8.3
	49–60 months	-	5.6	5.1	3.9
	61–120 months	-	3.3	4.1	2.1
	121 months or more	-	-	0.8	0.3
Risk factors	Burdened heredity	14.1	14.7	12.6	13.8
	Cerebral palsy	0.4	0.5	0.5	0.5
	Cerebral hemorrhage	0.8	1.0	1.3	1.1
	Premature birth	20.7	21.8	19.9	20.8

**Discussion.** The demographic and clinical profile of children with strabismus is also poorly understood, in-depth research in this aspect was conducted in India, although the volume of follow-up (286 patients) was small [8]. The number of children surveyed in our study (1,681, which is 86.4 per 100,000 of the total child population of Azerbaijan) is significantly higher. In this study, the demographic profile of patients also differs from the demographic profile according to our data (the proportion of girls is 54 and 38.7 %, respectively). Despite these differences, there is a similarity in the proportion of individual types of strabismus, in India [8] intermittent strabismus was more often detected (72 %). In our study, depending on the age of the children, this indicator ranged from 72–79.9 %. The proportion of infantile strabismus (8 % in India and 7.0–8.8 % in Azerbaijan), paralytic (1.0 % and 1.9–23 %, respectively) types of strabismus was similar.

In our population, most children were diagnosed with strabismus between the ages of 4 and 24 months. In India, the age range when strabismus was diagnosed was 0–180 months (median 30 months). In

Azerbaijan, strabismus was first detected in 84.5 % of cases before the age of 2 years (24 months). Obviously, strabismus was diagnosed in children in Azerbaijan much earlier.

According to anamnestic data, 20.8 % of children with strabismus were born prematurely, a similar indicator was given in the work of Indian scientists [8].

Thus, a comparison of the clinical and demographic profiles of children with strabismus in tertiary ophthalmology centers in Azerbaijan and India shows commonalities in a number of characteristics (the structure of strabismus types and likely risk factors), as well as significant differences in gender composition and age of initial detection of the pathology.

The study was conducted on the basis of a tertiary ophthalmology center, which may limit the sample's representativeness for the general population of children with strabismus. Some of the anamnestic information was obtained from the parents, which could affect the accuracy of data on the timing of pathology detection and risk factors.

## Conclusions

1. With a high level of primary treatment of children with strabismus at the tertiary stage of ophthalmic care (86.4±2.1 per 100,000 children), there is a significantly low frequency of hospitalization for surgical treatment (7.3±1.2 per 100,000 children). This indicates a lack of continuity of step-by-step care and the need for more active involvement of primary care physicians in the early detection of children with strabismus and their timely referral to a specialized center.

2. The treatment and hospitalization of children with strabismus at the tertiary stage is significantly higher at the age of 5–9 years, the gender difference remains (boys predominate among patients). Boys predominated among the patients, reflecting the gender characteristics of the treatment in the study population.

3. The clinical profile of children with strabismus at the tertiary level of ophthalmic care was generally independent of age. The most characteristic signs were the predominance of convergent concomitant strabismus, a high proportion of intermittent forms, as well as the detection of pathology mainly at the age of 4 to 24 months. Among the likely risk factors, premature birth and burdened heredity attracted attention.

*Prospects for further research. It is planned to study the frequency of treatment and hospitalization of children with strabismus at the tertiary level of ophthalmic care with an assessment of the clinical and demographic profile of patients in order to exclude errors in the organization of staged ophthalmic care that may affect the solution of this problem. It is advisable to actively involve family and district doctors and primary care ophthalmologists in the early detection of children with strabismus and their timely referral to the third stage to receive highly qualified ophthalmological care.*

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