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**NOSOLOGICAL STRUCTURE OF PEDIATRIC OPHTHALMOPATHOLOGIES: A
COMPARATIVE ANALYSIS**



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Abstract

Pediatric ophthalmology remains one of the most important issues in modern medicine, as vision impairment at an early age can affect a child's cognitive development and social adaptation. According to the World Health Organization, more than 1.4 million children worldwide suffer from irreversible blindness, and over 19 million have varying degrees of vision impairment. Research shows that the leading causes of blindness and visual impairment in children remain retinopathy of prematurity, congenital cataracts, juvenile glaucoma, hereditary retinal dystrophies, progressive forms of myopia, and eye injuries. However, the structure of diseases varies significantly: in developed countries, myopia is the most prevalent, while in developing regions, retinopathy of prematurity and congenital cataracts remain significant. Particular attention is paid to the development of region-specific prevention programs and the implementation and effective use of measures to reduce the global burden of childhood blindness.

Keywords: pediatric ophthalmology, retinopathy of prematurity, juvenile glaucoma, comparative analysis

**«НОЗОЛОГИЧЕСКАЯ СТРУКТУРА ОФТАЛЬМОПАТОЛОГИЙ У ДЕТЕЙ:
СРАВНИТЕЛЬНЫЙ АНАЛИЗ»**

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Аннотация

Актуальность исследования обусловлена тем, что педиатрическая офтальмология остаётся одной из приоритетных областей современной медицины, поскольку нарушение зрительных



функций в детском возрасте оказывает выраженное влияние на когнитивное развитие ребёнка, формирование его психоэмоциональной сферы и успешность социальной адаптации. По данным Всемирной организации здравоохранения, свыше 1,4 млн детей во всём мире страдают необратимой слепотой, а более 19 млн имеют различные степени снижения зрения. Современные исследования подтверждают, что ведущими причинами детской слепоты и выраженного снижения зрения являются ретинопатия недоношенных, врождённые катаракты, ювенильная глаукома, наследственные дистрофии сетчатки, прогрессирующие формы миопии, а также травматические повреждения органа зрения. В то же время установлено, что нозологическая структура детской офтальмопатологии имеет выраженные региональные особенности: в индустриально развитых странах наиболее распространённой патологией является миопия, тогда как в развивающихся регионах сохраняют высокую значимость ретинопатия недоношенных и врождённые катаракты. Указанные различия подчёркивают необходимость разработки регионально-специфичных программ профилактики и совершенствования организационных мероприятий, направленных на снижение глобального бремени детской слепоты и инвалидизации по зрению.

Ключевые слова: педиатрическая офтальмология, ретинопатия недоношенных, ювенильная глаукома, сравнительный анализ.

«BOLALAR OFTALMOPATOLOGIYALARINING NOZOLOGIK TARKIBI: QIYOSIY TAHLIL»

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Annotatsiya

Tadqiqotning dolzarbligi shundan iboratki, pediatrik oftalmologiya zamonaviy tibbiyotning ustuvor yo'nalishlaridan biri bo'lib qolmoqda. Chunki bolalik davrida ko'rish funksiyalarining buzilishi bolaning kognitiv rivojlanishiga, psixo-emotsional sohasining shakllanishiga va ijtimoiy moslashuv muvaffaqiyatiga sezilarli ta'sir ko'rsatadi. Jahon sog'liqni saqlash tashkiloti ma'lumotlariga ko'ra, butun dunyo bo'yicha 1,4 milliondan ortiq bola qaytarib bo'lmaydigan ko'rlikdan aziyat chekmoqda, 19 milliondan ziyod bola esa turli darajadagi ko'rish qobiliyati pasayishiga ega. Zamonaviy tadqiqotlar shuni tasdiqlaydiki, bolalarda ko'rlik va ko'rish qobiliyatining keskin pasayishining yetakchi sabablari — erta tug'ilgan chaqaloqlar retinopatiyasi, tug'ma katarakta, juvenil glaukoma, irsiy to'r pardasi distrofiyalari, progressiv miopiya shakllari hamda ko'zning travmatik shikastlanishlaridir. Shu bilan birga, bolalar oftalmopatologiyasining nozologik tarkibi mintaqaviy xususiyatlarga ega ekanligi aniqlangan: sanoati rivojlangan mamlakatlarda eng ko'p uchraydigan kasallik miopiya bo'lsa, rivojlanayotgan hududlarda erta tug'ilgan chaqaloqlar retinopatiyasi va tug'ma katarakta muhim ahamiyat kasb etmoqda. Ushbu tafovutlar mintaqaga xos profilaktika dasturlarini ishlab chiqish va bolalar ko'rligini hamda ko'rish qobiliyatidan nogironlikni kamaytirishga qaratilgan tashkiliy chora-tadbirlarni takomillashtirish zarurligini ta'kidlaydi.

Kalit so'zlar: pediatrik oftalmologiya, erta tug'ilgan chaqaloqlar retinopatiyasi, juvenil glaukoma, qiyosiy tahlil.

According to the World Health Organization (WHO), visual impairment and blindness in children account for about 4–6% of all cases of childhood disability, with more than 60% of cases preventable



or correctable with timely diagnosis and treatment[1]. The most significant conditions in clinical practice are amblyopia, strabismus, congenital anomalies of the eyeball and optic nerve, hereditary retinal dystrophies, keratopathies, inflammatory diseases of the anterior and posterior segments of the eye, and post-traumatic lesions.

Pediatric ophthalmopathologies represent a broad spectrum of diseases of the organ of vision, including pathologies of the eyeball, its adnexa, orbit, and visual pathways that develop before the age of 18. This spectrum includes congenital developmental abnormalities, hereditary degenerative processes of the retina and optic nerve, inflammatory lesions of the anterior and posterior segments of the eye, traumatic injuries, tumors, as well as functional disorders of accommodation and binocular vision[2,3]. According to the World Health Organization, ophthalmic pathologies account for up to 5% of childhood disabilities, with the leading causes of reversible blindness in the pediatric population being amblyopia, congenital cataracts, juvenile glaucoma, and refractive anomalies. Irreversible vision loss is mainly caused by congenital glaucoma, retinoblastoma, hereditary chorioretinal dystrophies, and optic nerve atrophy[4,5].

Pediatric ocular disorders can be classified according to **etiology, pathogenesis**, morphological and functional features. The following major categories are generally recognized:

1. **Retinopathy of Prematurity (ROP)**— Classified according to the International Classification of Retinopathy of Prematurity (ICROP): zone, stage (1–5), extent, and presence of “plus disease.”
2. **Congenital and Hereditary Disorders** — congenital cataract, congenital/juvenile glaucoma, microphthalmia, coloboma, optic nerve hypoplasia, inherited retinal dystrophies (retinitis pigmentosa, Stargardt disease, Best disease), hereditary optic neuropathies.
3. **Refractive and Functional Visual Disorders** — refractive errors (myopia, hyperopia, astigmatism), amblyopia, strabismus, accommodative and binocular vision disorders.
4. **Inflammatory Eye Diseases** — infectious (bacterial keratitis, viral keratoconjunctivitis, congenital toxoplasmosis, CMV retinitis); — autoimmune (juvenile idiopathic arthritis—associated uveitis, sarcoidosis-related uveitis).
5. **Ocular and Orbital Tumors** — retinoblastoma, rhabdomyosarcoma, optic pathway glioma, medulloepithelioma.
6. **Traumatic Ocular Lesions** — mechanical injuries, chemical/thermal burns, post-traumatic cicatricial changes.

Epidemiological data from recent years show marked differences in the structure of ophthalmic diseases in children in different regions of the world. These differences are determined both by the level of socioeconomic development and by the availability of screening programs and ophthalmic surgical care.

Table 1. Structure of pediatric ophthalmopathologies by region [6-8]

Nosological group	Europe	USA	CIS
Refractive errors	20–25%	20–25%	18–22%
Amblyopia	2–5%	2–4%	5–10%
Strabismus	2–4%	2–3%	3–5%
Congenital cataracts	0.2–0.4%	0.1–0.2%	0.3–0.5%
Congenital/juvenile glaucoma	0.05–0.1%	0.05–0.1%	0.1–0.2%
Retinopathy of prematurity (ROP)*	0.2–0.3% (up to 10% among premature <1,500 g)	0.2–0.3% (6–8% among premature)	0.4–0.6% (10–15% among premature)



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Hereditary retinal dystrophies	0.1–0.2%	0.1–0.2%	0.1–0.3%
Eye injuries	1–2%	1–2%	3–5%
Tumors (retinoblastoma, etc.)	<0.1%	<0.1%	<0.1%

* ROP is listed separately, as its prevalence is calculated for the group of premature infants.

A comparative analysis revealed marked differences in the structure of pediatric ophthalmic pathologies between regions, which are largely determined by both the age of disease manifestation and the organization of ophthalmic care.

Refractive disorders. The highest incidence occurs during school age and adolescence. In Europe and the US, the prevalence of myopia and astigmatism reaches 25–35%, confirming the trend toward their increase in urban populations. In the CIS countries, the figures are close to those in Europe, but late detection often leads to the development of persistent forms of amblyopia.

Amblyopia and binocular vision disorders. These conditions mainly develop during preschool age (2–6 years). In developed countries, they are detected in 2–4% of children, while in the CIS countries the rates are higher (up to 8–10%), which is explained by the lower availability of screening programs.

Congenital eye malformations.

The most significant include congenital cataracts and glaucoma. In Europe and the US, their incidence does not exceed 0.5%, which is associated with an effective system of neonatal ophthalmological screening and early surgical correction. In the CIS countries, the proportion of congenital diseases is higher (0.5–1%), and diagnosis is often only made at the stage of pronounced clinical manifestations.

Retinopathy of prematurity (ROP). This pathology is the key cause of blindness in children with extremely low birth weight. In Europe and the US, severe forms of RP occur in 6–8% of premature infants, while in CIS countries this figure is around 10%, which is directly related to the limited coverage of screening programs.

Traumatic eye injuries.

They are most common among school-age children and adolescents. In developed countries, they account for no more than 1–2% of all injuries, while in the CIS countries, this figure rises to 4–5%, which is associated with insufficient prevention of childhood injuries and less access to specialized care.

Conclusion

The structure of ophthalmic diseases in children varies significantly between regions and is largely determined by the level of organization of ophthalmic care. In developed countries, refractive errors and amblyopia account for the majority of cases, while congenital forms of pathology are extremely rare. In the CIS countries, there is still a high incidence of amblyopia, strabismus, and retinopathy of prematurity, which is associated with late diagnosis and limited access to specialized monitoring programs. Age-related characteristics of disease distribution are also of fundamental importance: congenital forms determine the prognosis in the first months of life, amblyopia and strabismus are mainly detected in preschool age, and refractive errors and eye injuries become most significant in school and adolescence. The results obtained emphasize the need for a comprehensive approach to assessing the nosological structure of pediatric ophthalmopathologies and the importance of adapting national healthcare systems to the specifics of age and regional factors.



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