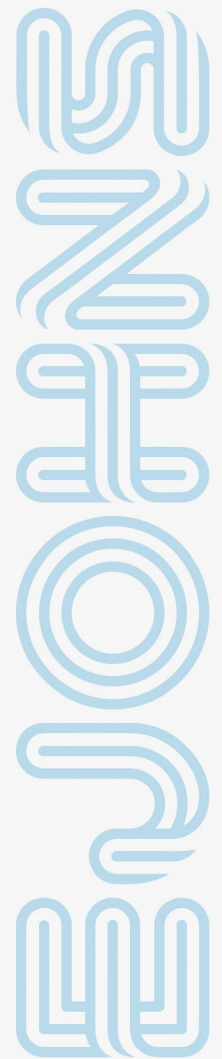


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AUDITORY CORRECTION FOR SENSORINEURAL HEARING LOSS IN CHILDREN OF PRE-SCHOOL AND SCHOOL AGE*Karimov J.S.¹, Nadjimutdinova N.Sh.¹, Inoyatova F.I.¹*¹ Republican Specialized Scientific Practice Medical Center of Pediatrics

Abstract. Due to the growing prevalence of hearing impairment, the problem of hearing loss and deafness in children has great social significance. According to WHO forecasts, by 2020 the number of people with socially significant hearing impairments is expected to increase by more than 30%. The article presents methods for diagnosing hearing loss in preschool children using tone-threshold audiometry, tympanometry, acoustic reflexometry and play audiometry, which allows us to determine minimal hearing impairment. Electroacoustic hearing correction was performed using modern digital programmable behind-the-ear hearing aids (HA) with custom-made earmolds.

Keywords: sensorineural hearing loss, impedancemetry, short-latency auditory evoked potentials, hearing aids.

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СЛУХОВАЯ КОРРЕКЦИЯ СЕНСОНЕВРАЛЬНОЙ ТУГОУХОСТИ У ДЕТЕЙ ДОШКОЛЬНОГО И ШКОЛЬНОГО ВОЗРАСТА*Каримов Ж.С.¹, Наджимутдинова Н.Ш.¹, Иноятлова Ф.И.¹*¹ Республиканский специализированный научно-практический медицинский центр педиатрии

Аннотация. В связи с ростом распространенности нарушений слуха проблема тугоухости и глухоты у детей имеет большое социальное значение. По прогнозам ВОЗ, к 2020 году число людей с социально значимыми нарушениями слуха увеличится более чем на 30%. В статье представлены методы диагностики тугоухости у детей дошкольного возраста с использованием тонально-пороговой аудиометрии, тимпанометрии, акустической рефлексометрии и игровой аудиометрии, которые позволяют определить минимальные нарушения слуха. Электроакустическая коррекция слуха проводилась с использованием современных цифровых программируемых заушных слуховых аппаратов (НА) с индивидуально изготовленными ушными вкладышами.

Ключевые слова: нейросенсорная тугоухость, импедансометрия, коротколатентные слуховые вызванные потенциалы, слуховые аппараты.

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RELEVANCE

Sensorineural hearing loss is a form of hearing reduction in which any part of the sound-receiving section of the auditory analyzer is affected, starting from the sensory cells of the inner ear and ending with the cortical representation in the temporal lobe of the cerebral cortex [1].

According to the authors, among 1,000 newborns, 1 child is born with total deafness. Additionally, during the first 2-3 years of life, another 2-3 children lose their hearing [1, 2].

Data on the prevalence of mild and moderate hearing loss require clarification, which is related

to the late consultation of parents of children with this pathology to specialists, as well as a lack of vigilance from pediatricians (in 1/3 of cases, mild and moderate hearing losses are first identified at the age of 3-7 years) [3].

Hearing impairment in a child leads to disruptions in their speech and mental development. According to modern studies, early diagnosis of auditory disorders and subsequent adequate rehabilitation can prevent speech disturbances in children and the development of other higher mental functions.

Diagnosis and rehabilitation of hearing impairments in young children with sensorineural

hearing loss and deafness is one of the most challenging areas of pediatric audiology. Difficulties in diagnosing precise hearing thresholds in children under 3 years old are well known, as tonal threshold audiometry cannot be performed. It is believed that the most reliable methods for assessing hearing in children under 3 years old are the use of objective assessment methods (registration of otoacoustic emissions and various classes of auditory evoked potentials) [2, 4, 5].

Upon confirmation of sensorineural hearing loss, a child requires hearing aid fitting, i.e., the use of modern digital hearing aids, and in cases of profound hearing loss (hearing loss of degree IV and deafness), the high-tech rehabilitation method of cochlear implantation is recommended [6, 7].

OBJECTIVE OF THE STUDY

To objectively assess sensorineural hearing loss and hearing aid fitting in preschool and school-age children.

PATIENTS AND METHODS

In the congenital and acquired ENT diseases department of the Republican Specialized Scientific and Practical Medical Center for Pediatrics of the Republic of Uzbekistan, we examined 72 children with sensorineural hearing loss of varying degrees of severity, aged preschool and school age. Among them, there were 39 boys and 33 girls (table 1). The study was conducted in 2023-2024. Children underwent both objective and subjective assessment methods. Bilateral hearing aids were fitted for 16 children, while 39 children received monaural fitting.

Children with conductive or mixed types of hearing loss were not included in the study. The study included:

- Collection of complaints and history;
- Clinical examination of the ENT organs;
- Tonal threshold audiometry, tympanometry, and acoustic reflexometry, play audiometry;
- If necessary, registration of otoacoustic emissions (OAE) and short-latency auditory evoked potentials (SLAP) of the brain.

Children underwent registration of SLAP in physiological or medicated (for patients with mental disorders) sleep. The examined patients were initially consulted by a specialist in audiology, a neurologist, and a psychologist. Children with high degrees of

hearing loss were fitted with hearing aids, and in cases of ineffectiveness, as well as for children with deafness, cochlear implantation was recommended.

Among all examined children, urban residents made up 43% of the total, while rural residents accounted for 57% (table 2).

DISCUSSION OF RESULTS

As a result of the study, bilateral congenital hearing loss was diagnosed in 53 children, and bilateral acquired hearing loss was diagnosed in 19 (24.6%). In the study group (72 children, 144 ears), children with varying degrees of hearing loss were present: degree II – 18 (9.6%) ears, degree III – 85 (54.4%) ears, degree IV and deafness – 41 (36%) ears.

All children exhibited delays in speech development. In 17 (23.6%) children with degree IV hearing loss and deafness, fitting was not conducted due to the absence of peak V in the auditory evoked potential; cochlear implantation was recommended for them. The remaining 55 (76.4%) children underwent electroacoustic correction of hearing using modern digital programmable behind-the-ear hearing aids with individually manufactured ear molds. After 2-3 months, frequency-specific adjustments to the hearing aids were made.

During audiology testing 4-5 months later: the response to all primary sounds was good, they responded to conversational speech from 4 meters, and could distinguish and reproduce individual monosyllabic words.

Subsequently, all children showed improvement in the results of auditory-speech rehabilitation. The effectiveness of electroacoustic hearing correction was assessed based on the child's hearing and speech development, and dynamic testing by an audiologist. The most significant factors influencing the quality of hearing aid fitting and the auditory-speech development of children were:

- Correct selection of hearing aid parameters;
- Adequacy of hearing aid adjustment;
- Quality of the custom ear mold.

The best results in a child's auditory-speech development were observed with early detection of hearing loss, early fitting of hearing aids, absence of comorbid pathology, as well as regular sessions with an audiologist and parents.

Table 1

Distribution of surveyed persons by gender and age

Age group	Male	Female	Total by groups	%
From 3 to 6 years	21	8	29	40.3
From 7 to 14 years	18	25	43	59.7
Total	39	33	72	100

Table 2

Distribution of patients by place of residence

Urban	%	Rural	%	Total
31	43	41	57	72

CONCLUSION

The auditory-speech development of a child depends on the timeliness of detecting hearing loss or deafness, the adequacy of the chosen rehabilitation tool (hearing aid), and the sufficiency of audiological support. For children with asymmetric hearing impairments, binaural fitting of hearing aids is effective. Early detection of hearing impairment and comprehensive rehabilitation enable children with sensorineural hearing loss and deafness to achieve a good level of speech development and promote the social integration of the child.

CONFLICT OF INTERESTS

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

SOURCES OF FUNDING

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AVAILABILITY OF DATA AND MATERIALS

All data generated or analysed during this study are included in this published article.

AUTHORS' CONTRIBUTIONS

All authors contributed to the design and interpretation of the study and to further drafts. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All applicable international, national, and/or

institutional guidelines for the care and use of animals were followed.

CONSENT FOR PUBLICATION

Not applicable.

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КОНФЛИКТ ИНТЕРЕСОВ

Авторы заявляют, что данная работа, её тема, предмет и содержание не затрагивают конкурирующих интересов.

ИСТОЧНИКИ ФИНАНСИРОВАНИЯ

Авторы заявляют об отсутствии финансирования при проведении исследования.

ДОСТУПНОСТЬ ДАННЫХ И МАТЕРИАЛОВ

Все данные, полученные или проанализированные в ходе этого исследования, включены в настоящую опубликованную статью.

ВКЛАД ОТДЕЛЬНЫХ АВТОРОВ

Все авторы внесли свой вклад в подготовку исследования и толкование его результатов, а также в подготовку последующих редакций. Все

авторы прочитали и одобрили итоговый вариант рукописи.

ЭТИЧЕСКОЕ ОДОБРЕНИЕ И СОГЛАСИЕ НА УЧАСТИЕ

Были соблюдены все применимые международные, национальные и/или институциональные руководящие принципы по уходу за животными и их использованию.

СОГЛАСИЕ НА ПУБЛИКАЦИЮ

Не применимо.

ПРИМЕЧАНИЕ ИЗДАТЕЛЯ

Журнал "Евразийский журнал оториноларингологии - хирургии головы и шеи" сохраняет нейтралитет в отношении юрисдикционных претензий по опубликованным картам и указаниям институциональной принадлежности.

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