

FEATURES OF CHANGES IN AUDITORY FUNCTION IN CHILDREN WITH CHRONIC KIDNEY DISEASE

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The relationship between kidney function and hearing loss has long been recognized, but evidence for this relationship has mostly come from small observational studies or from other populations. In most cases, the causes contributing to the development of hearing loss in children with chronic kidney disease (CKD) are complications and/or manifestations of the disease itself, as well as side effects of its treatment. It is also possible that there is a connection between anatomical and physiological features of the nephron and the striatovascular system of the cochlea. **The aim of this study** was to assess the state of auditory function in children with CKD. **Materials and methods.** 31 children with CKD were examined, five patients were on hemodialysis, while 26 children did not receive hemodialysis. All children underwent an audiological examination. **Results.** According to the results of a comprehensive audiological examination, five children suffered from hearing loss of various forms and severity, while one child was diagnosed with bilateral deafness. As CPN progressed, patients became more likely to develop hearing impairments. Among the etiological factors underlying the development of hearing loss, pharmacological side effects are considered to be the main ones.

Keywords: chronic kidney failure, children, auditory function.

The World Health Organization (WHO) reported that approximately 432 million people suffered from disabling hearing loss in 2018 and estimated that over 900 million people will have disabling hearing loss by 2050 [1]. Hearing loss in children not only brings about communication difficulties in daily life but also has negative effects on an individual's cognitive and psychosocial function. Hearing loss could lead to social isolation, financial strain, and a low health-related quality of life [2-4]. Because most cases of hearing loss are acquired and difficult to recover from, but preventable, exploring the risk factors of hearing loss is of great significance. Kidney disease has become a public health issue of global concern in recent years. Renda et al. [5] also found a significant association between the duration of hemodialysis and hearing loss in children aged 6-18 years with dialytic chronic kidney disease (CKD). Early detection of hearing impairment in children suffering from patients with CKD are extremely important, since such patients are already disabled and have limitations in life. Due to the severity of the course of CKD, diagnostic, tech therapeutic and rehabilitation measures for directed to the preservation and maintenance of kidney function and other vital organs and systems, so you the phenomenon of hearing impairment in children with such a severe pathologicalgia does not always occur in a timely manner. Risk factors contributing to the development of ear in children with CKD are complications

and/or pro-manifestations of the disease itself, as well as side effects from ongoing therapy and treatment of complications.

Damage to the auditory analyzer in chronic renal pathology may be acquired. A number of chadesired infectious diseases with multiple organ failure sufficiency can lead to hearing loss and impaired niyama kidney function. Hearing changes in CKD can be genetically associated (according to authors, in 22-35% of all children with kidney pathology). Known syndromes associated with early onset kidney pathology and hearing loss/deafness [6-8].

There are a number of anatomical and physiological similarities between the kidney nephron and the vascular band of snails. At the ultrastructural level, it was found that the nephron and the cochlea consist of epithelial structures that are in contact with the vessels that feed them. Many researchers prove the antigenic affinity between the structures of the renal glomerulus and the strips of the vascular cochlea. The mechanism of active transport is similar to the mechanism of fluid and electrolyte transfer carried out through the vascular band of the cochlea and the glomerulus of the nephron [9]. With development hyponatremia during hemodialysis, some studies vates associated emerging in 87% of patients with acute kidney failure and CKD hearing disorders on cochlea level [5]. At the same time, research groups of scientists have shown that patients who are were on program hemodialysis, there was a decreasehearing after completion of a

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dialysis session, even with normal low concentration of sodium in plasma [10-11]. CKD, including under the influence of RRT, needs careful study. It is the ionic differences on both sides the crowns of the Reissner membrane of the cochlea determine the micro-electrical phenomena in the organ of Corti, which provide chivayut high sensitivity of the auditory receptor. Similar pharmacological effects are also known pathological changes detected on ultrastructural level in the kidney in patients with CKD and in the cochlea with sensorineural hearing loss. In CKD, due to loss of kidney function, there is an accumulation of uremic toxins, develop violations of the electrolyte composition of the blood, metabolic sky acidosis; fluid retention, phosphate, disorders vitamin D metabolism, lack of erythropoietin. By-Therefore, when managing patients with CKD, regardless of the ranks, all therapeutic measures are aimed at correcting nutritional status, arterial hypertension diseases, nephrogenic anemia, metabolic acidosis, violations of phosphorus-calcium metabolism, as well as sub-maintenance and replacement of lost kidney function. CKD in the early stages is a condition that, without appropriate treatment leads to terminal chronic renal failure (ESRD), tre-ongoing RRT – hemodialysis or peritoneal dia-lysis followed by kidney transplantation, or dodia-lyse transplant. In the treatment of CKD, cytostatics and loop-diuretics known for their ototoxic effects in the inner ear, humanized monoclonal antibodies (eculizumab). After kidney transplant. All children are given life-long immunosuppressive therapy (mycophenolatmofetil, cyclosporine A, prograf, advagraf, azathioprine, prednisolone), and each child is given an individualized treatment, consisting of a combination of different drugs [12]. **The aim of the study** was to study the state of the auditory functions in children with CKD.

Materials and Methods. We examined 31 children with an established diagnosis of CKD with various stages and who are undergoing inpatient treatment in the nephrology department of the National Children's Center. The age range ranged from four to 18 years, of which three boys and 28 girls, 5 (16%) patients receive hemodialysis. Six patients presented complaints from the ENT organs: one – for bilateral deafness, 5 children – for a

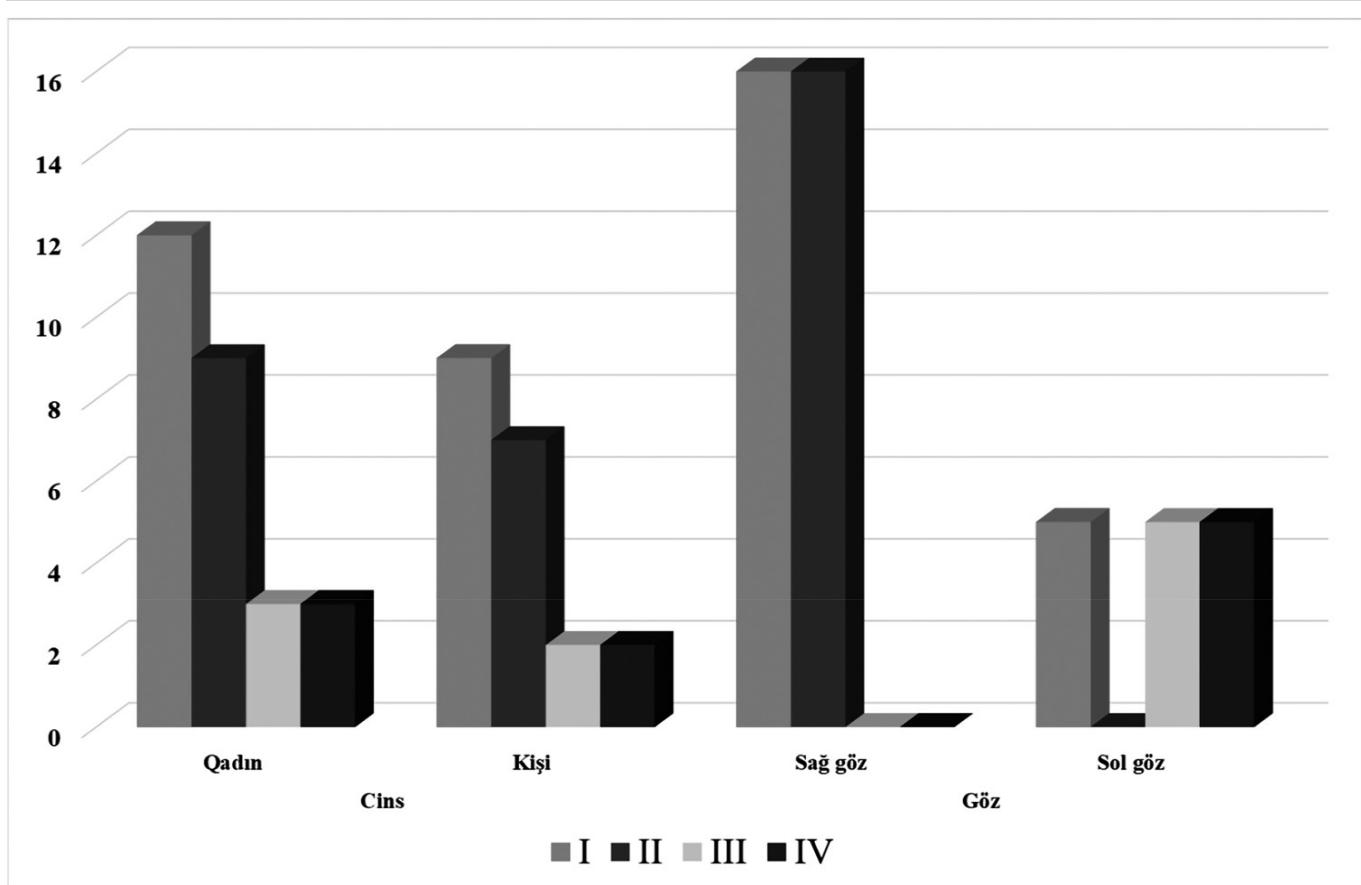
decrease in various degrees of severity, 2 – for difficulty nasal breathing. The examination revealed pathology of the ENT organs in 10 patients: chronic compensated inflammation of the tonsils – in 6, curvature of the nasal septum – in four. 11 children have a history of perinatal damage to the nervous system, with delayed psychorechological development. Coordination disorders with tremor were diagnosed in six children.

The comprehensive examination included anamnesis collection, identification of complaints of patients and their parents and clinical examination of ENT organs to all examined patients, assessment and extended audiological hearing examination, which included audiometry of the tonal threshold, acoustic impedance measurement, and registration of auditory evoked potentials with a short delay.

Results and discussion. During an extended audiological examination, six (19%) children were diagnosed with hearing impairment of various types: three – bilateral conductive hearing loss of the 1st degree, 2 – bilateral mixed hearing loss of the 2nd degree, 1 – bilateral sensorineural hearing loss of various degrees.

One child diagnosed with bilateral deafness had a kidney transplant. For auditory rehabilitation, all these patients underwent cochlear implantation (CI). Children with bilateral sensorineural hearing loss of varying degrees were assigned binaural hearing aids with digital hearing aids.

A comparative analysis of the data showed that hearing disorders are more often manifested during RRT in children with CRF who are on peritoneal dialysis and in patients with various kidney malformations and congenital anomalies of the kidneys and urinary tract, as well as in patients after kidney transplantation. The frequency and degree of hearing loss increase with increasing duration of dialysis. Concomitant neurological pathology exacerbates hearing problems. Electrolyte imbalance, hypertension, proteinuria and azotemia in patients with CKD appear to have cumulative effect on the cochlear receptor apparatus and contribute to the death of hair cells. Similar the mechanism of active transport of fluid and electrolytes, which is carried out through the stria vascularis cochlea and nephron glomerulus, may be the reason for the similar influence of genetic factors and similar medicinal effects



Şək. 2. Retrospektiv tədqiqatda RVT ilə induksiyası

on the kidney and cochlea.

Thus, 19% of children with CKD are diagnosed with hearing loss and deafness, which significantly worsened the condition of each child and died adaptation.

Conclusion. 1. Among the etiological factors of hearing loss, the leading ones seem to be high doses and, probably aminoglycosides.

2. Therapy of conductive hearing loss in patients with CKD is efficient. Patients with sensorineural hearing loss need additional dispensary observation and correction of hearing loss by means of hearing aids.

3. Speech development disorders (except in the case of congenital deafness) and encephalopathy are associated with toxic damage to the central nervous system caused by the underlying disease.

Timely detection of hearing disorders will significantly improve the quality of life of children

with CKD. They need to undergo screening audiological examination twice a year. It is necessary to pay special attention to children with CKD and diagnosed syndromes combining hearing loss and kidney pathology, which take place for examination without covering hearing impairment due to the occurrence of hearing loss in a particular syndrome. The search for predisposition to the development of hearing loss and the causes of deafness in children with CKD, namely the identification of molecular genetic markers and phenotypic features, is an important step in the diagnostic algorithm for detecting hearing loss in patients with CKD. Only the joint work of otorhinolaryngologists, cardiologists and pediatricians of various specialties (pediatricians, nephrologists, urologists, geneticists, etc.) can provide early detection of hearing loss in children with CKD, which will prevent the development of disability in them.

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XÜLASƏ

XRONİKİ BÖYRƏK ÇATIŞMAZLIĞI OLAN UŞAQLARDA EŞİTMƏ FUNKSIYASININ DƏYİŞİKLİKLƏRİNİN XÜSUSİYYƏTLƏRİ

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Böyrək funksiyası ilə eşitmə itkisi arasındaki əlaqə çoxdan öyrənilmişdir, lakin bu əlaqəyə dair dəlillər əsasən kiçik müşahidə tədqiqatlarından əldə edilmişdir. Əksər hallarda, xroniki böyrək çatışmazlığı (XBÇ) olan uşaqlarda eşitmə itkisinin inkişafına səbəb olan səbəblər xəstəliyin ağrılaşmaları və/və ya təzahürləri, həmçinin müalicəsinin yan təsirləridir. Nefronun anatomik və fizioloji xüsusiyyətləri ilə ilbizin zolaqlı-damar sistemi arasında bir əlaqə olması da mümkündür. **Tədqiqatın məqsədi** XBÇ olan uşaqlarda eşitmə funksiyasının vəziyyətini qiymətləndirmək olmuşdur. **Material və metodlar.** Ümumilikdə müxtəlif mərhələli XBÇ olan 31 uşaq müayinə edildi, 5 xəstə planlı hemodializ müalicəsi alındı halda, 26 uşaq hemodializ almırıdı. Bütün uşaqlar audioloji müayinədən keçiblər. **Nəticələr.** Hərtərəfli audioloji müayinənin nəticələrinə görə, 5 uşaga müxtəlif formalı və şiddətli eşitmə itkisi, 1 uşaga ikitərəfli karlıq diaqnozu qoyuldu. XBÇ irəlilədikcə xəstələrdə eşitmə pozğunluğu inkişaf etmə ehtimalı artırdı. Eşitmə itkisinin inkişafının əsasını təşkil edən etioloji amillər arasında farmakoloji yan təsirlər əsas hesab olunur.

Açar sözlər: xroniki böyrək çatışmazlığı, uşaqlar, eşitmə funksiyası.

РЕЗЮМЕ

ОСОБЕННОСТИ ИЗМЕНЕНИЙ СЛУХОВОЙ ФУНКЦИИ У ДЕТЕЙ С ХРОНИЧЕСКОЙ БОЛЕЗНЬЮ ПОЧЕК

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Взаимосвязь между функцией почек и потерей слуха давно изучена, но доказательства этой взаимосвязи в основном получены в результате небольших наблюдательных исследований. В большинстве случаев причинами, способствующими развитию потери слуха у детей с хронической болезнью почек (ХБП), являются осложнения и/или проявления самого заболевания, а также побочные эффекты его лечения. Также возможно, что существует связь между анатомическими и физиологическими особенностями нефронов и полосато-сосудистой системой улитки. Целью данного исследования была оценка состояния слуховой функции у детей с ХБП. **Материалы и методы.** Всего был обследован 31 ребенок с различной стадией ХБП, 5 пациентов находились на гемодиализе, в то время как 26 детей гемодиализ не получали. Все дети прошли аудиологическое обследование. **Результаты.** По результатам комплексного аудиологического обследования 5 детей

страдали потерей слуха различных форм и степени тяжести, в то время как у 1 ребенка была диагностирована двусторонняя глухота. По мере прогрессирования ХБП, у пациентов повышалась вероятность развития нарушений слуха. Среди этиологических факторов, лежащих в основе развития потери слуха, основными считаются фармакологические побочные эффекты.

Ключевые слова: хроническая почечная недостаточность, дети, слуховая функция.

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