

The newborn hearing screening results in Kastamonu Education and Research Hospital

Kastamonu Eğitim ve Araştırma Hastanesi'nde yenidoğan işitme taraması sonuçları

 Ayhan Kars,  Fatma Atalay,  Kübra Topal

Kastamonu University Faculty of Medicine, Department of Otorhinolaryngology, Head and Neck Surgery, Kastamonu, Turkey

ABSTRACT

Purpose: The purpose of this study is to report the results of newborn hearing screening performed in 2017-2020 at the Kastamonu Education and Research Hospital, Turkey.

Material and Method: Six thousand seven hundred and ninety newborns undergoing hearing screening between January 2017 and December 2019 at the Kastamonu Education and Research Hospital were included in this retrospective study. The screening ABR test was performed with all babies. Test findings retrieved from our hospital and the central database were subjected to analysis.

Results: 4701 babies passed the 1st test, 1920 babies passed the 2nd test, 139 babies passed the 3rd test. Of the 30 babies who could not pass these 3 screening ABR tests and were referred to the reference center, 19 passed the test. Of the remaining 11 babies (0.162%), 7 (0.103%) had unilateral sensorineural hearing loss (SNHL) and 4 (0.058%) had bilateral SNHL.

Conclusion: It is very important for hearing loss to be detected via screening tests in the first three months and for treatment and rehabilitation to be started within six months at the latest. These babies can thus acquire normal hearing and not lag behind their peers in terms of linguistic, social, and cognitive skill development.

Keywords: Hearing loss, hearing screen, newborn, screening ABR

ÖZ

Amaç: Bu çalışmada 2017-2020 yılları arasında Kastamonu Eğitim ve Araştırma Hastanesi'nde yapılan yenidoğan işitme taraması sonuçlarının bildirilmesi amaçlanmıştır.

Gereç ve Yöntem: Retrospektif olarak planlanan bu çalışmaya 2017 Ocak-2019 Aralık ayları arasında Kastamonu Eğitim ve Araştırma Hastanesi'nde işitme taraması yapılan 6790 yenidoğan dahil edildi. Tüm bebeklere tarama ABR testi yapıldı. Hastanemizden ve merkezi veri tabanından elde edilen test sonuçları analiz edildi.

Bulgular: 4701 bebek 1. testten, 1920 bebek 2. testten, 139 bebek 3. testten geçti. Bu 3 tarama ABR testinden geçemeyen ve referans merkeze sevk edilen 30 bebekten 19'u testi geçti. Kalan 11 bebekten (%0,162) 7'sinde (%0,103) tek taraflı, 4'ünde (%0,058) ise iki taraflı sensörinöral işitme kaybı tespit edildi.

Sonuç: İşitme kaybının yaşamın ilk 3 ayında tarama testi ile tespit edilerek en geç 6 ay içerisinde tedavi ve rehabilitasyona başlanması çok önemlidir. Böylece bu bebekler normal işitmeye sahip olmakta ve dil, sosyal ve kognitif yeteneklerin gelişmesi yönüyle yaşitlarından geri kalmamaktadırlar.

Anahtar Kelimeler: İşitme kaybı, işitme taraması, tarama ABR, yenidoğan

Corresponding Author / Sorumlu Yazar:
Ayhan Kars, drakars25@hotmail.com

Received / Geliş: 22.04.2021 **Accepted / Kabul:** 27.08.2021

Cite this article as / Bu makaleye atf için: Kars A, Atlay F, Topal K. The newborn hearing screening results in Kastamonu Education and Research Hospital. Kastamonu Med J 2021; 1(3): 63-66



INTRODUCTION

Hearing loss is one of the most widespread congenital anomalies, being seen in 1-6 live births per 1000 (1). This rate is higher than those of metabolic diseases that have been screened for many years, such as hypothyroidism, phenylketonuria, and biotinidase deficiency (2). The first year of life is the most critical period in terms of speech and language development. The important factor in speech learning, an acquired behavior, is hearing (1). Normal hearing is highly important in terms of babies' social, sensory, and mental development (2). Hearing loss affects children's psychosocial and academic development (1). Delayed speech and language development results in learning difficulty and academic failure, mental development delay, communication disorder, social isolation, lack of self-esteem, and professional failure (1,3). The hearing screening test is highly important in terms of the early diagnosis and treatment of hearing loss and of reducing its deleterious effects (1,2). Normal ranges of academic performance, language and perception skills, adaptation to the external environment, and communication with peers have been determined in children diagnosed with hearing loss but rehabilitated in the early period (1). Children can be protected against the adverse consequences of hearing loss and deafness through early diagnosis and treatment (3). The American Pediatric Academy recommends hearing screening in the first month after birth, detection of loss of hearing within three months, and the requisite medical interventions within six months (4). Those measures resulted in detection of hearing loss in America decreasing from 12-24 months of age to 3-6 months. Several countries introduced their own Newborn Hearing Screening Program (NHSP) in subsequent years (2).

NHSP is the most effective means of identifying hearing loss within the recommended time frame (3). NHSP application in Turkey commenced in 2003 and has been systematically implemented since 2005 (1,3). Otoacoustic emission (OAE) and auditory brain response (ABR) tests are applied either individually or in combination in newborn hearing screening (1). The ABR test is performed on all babies within the scope of newborn hearing screening in our hospital. The purpose of this study is to report the results of newborn hearing screening performed in 2017-2020 at the Kastamonu Education and Research Hospital, Turkey.

MATERIAL AND METHOD

Six thousand seven hundred and ninety newborns undergoing hearing screening between January 2017 and December 2019 at the Kastamonu Education and Research Hospital were included in this retrospective study. The study was carried out with the permission of Kastamonu University Clinical Research Ethics Committee (Date: 23.06.2021, Decision no: 2020-KAEK-143-102). The research was performed in accordance with the ethical principles of the Declaration of Helsinki (5). The screening ABR test was performed with all babies motionless in a sleeping or calm state, by an experienced audiometry technician, in a hearing screening room especially designed for the purpose. An MB11 BeraPhone (Maico Germany) device was used for the ABR tests. Under the scope of the Ministry of Health NHSP protocol, neonates born in our hospital underwent the first test within 72 h before discharge, while those born in external centers and presenting to our hospital for hearing tests were

tested during presentation. Babies passing the test from both ears were regarded as healthy. Babies who failed to pass the first test were examined by an ear, nose, and throat specialist. Babies with obstructive debris or cerumen in the outer ear canal at otoscopic examination or with otitis media were identified. Tympanometry tests were performed on babies with suspected otitis media with effusion using an AT235 device (Interacoustics, Denmark). Once these problems had been resolved, babies who failed the first test from one or both ears underwent a second test after one week. Babies failing the second test from one or both ears then underwent a third test, and the entire test process was completed within 30 days. Babies failing the third test from one or both ears were referred to a reference center, in line with Ministry of Health recommendations, and underwent clinical ABR tests. Families were given all requisite information at all test stages. All test results are routinely transferred to the Ministry of Health database. Test findings retrieved from our hospital and the central database were subjected to analysis.

Statistical analysis was performed using SPSS Statistics Version 20.0 (IBM Corporation, Armonk, NY, USA). Numeric variables were expressed as mean±standard deviation (SD) and median (minimum-maximum) values. Categorical variables were expressed as count and percentage values.

RESULTS

The NHSP results from our hospital are shown in **Table 1**. Screening ABR tests were performed on 6790 newborns during the study period. Hearing was normal in both ears in 4701 (69.2%) babies, and these duly passed the first test. The remaining 2089 babies who failed the first test with one or both ears were examined by an ear, nose, and throat specialist. Babies with obstructive debris or cerumen in the outer ear canal or otitis media were identified at otoscopic examination. Tympanometry tests were performed on babies with suspected otitis media with effusion following examination. The second test stage began once these babies' problems had been resolved, and 1920 (28.3%) of the 2089 babies passed the second test, hearing in both ears being regarded as normal. One hundred thirty-nine (2.1%) of the 169 children with abnormal hearing in one or both ears at the second test passed the third test, and their hearing was considered normal in both ears. Thirty babies (0.4%) with abnormal hearing detected in one or both ears at the third screening ABR test were referred to a reference center. Normal hearing in both ears was measured in 19 of these babies at clinical ABR performed at the reference center. Unilateral sensorineural hearing loss (SNHL) was determined in seven (0.103%) of the remaining 11 babies (0.162%) and bilateral SNHL in four (0.059%) (**Table 2**). We subsequently learned that these babies with unilateral or bilateral SNHL had been included in a rehabilitation program.

Table 1. Screening test results with ABR

Number of babies tested for the first time for screening	6790 (100%)
Number of babies tested for the second time for screening	2089 (30.8%)
Number of babies tested for the third time for screening	169 (2.5%)
Number of babies referred with suspected hearing loss	30 (0.4%)
ABR: Auditory Brainstem Response	

Table 2: Hearing loss detected by clinical ABR.

	N	%
Bilateral SNHL	4	0.103
Unilateral SNHL	7	0.059
Total	11	0.162

ABR: Auditory Brainstem Response SNHL: Sensorineural hearing loss.

DISCUSSION

NHSP is extensively recognized and applied across the world. Congenital or acquired hearing losses can be quickly identified through these screening programs (2). While hearing loss rates in neonates vary from country to country, the incidence is 1-6 per 1000 live births (1). Children's speech and language development, and therefore also their communication, academic performance, and social life, are affected if hearing loss is not detected early and the requisite measures taken (1,2). Hearing screening tests must therefore be performed on all newborns for early diagnosis and treatment. Neither parents nor physicians are able to detect hearing loss in newborns in the first year of life, and diagnosis and treatment may be delayed until the age of 2.5-3 years. The NHSP is therefore of great importance (1). The program must be applied to all babies before they leave the hospital (2).

Although screening protocols differ, their outcomes are similar (1). The screening ABR test has been applied to all newborns in recent years as recommended by the Turkish Ministry of Health. This is a rapid and rapid test easily performed on newborns (6). The ABR test increases the success and productivity of the screening program and also reduces the numbers of patients referred to reference centers (2). The low false positivity rate in hearing screening programs protects parents against unnecessary anxieties, and this further enhances confidence in these programs (7). Narrowing in the outer ear canal, cerumen accumulation, and effusion or inflammation in the middle ear can all cause misleading results (2). It is therefore important for babies who fail the first screening test to undergo otoscopic examination by an ear, nose, and throat specialist. This was the case in all our such patients.

Risk factors are present in 50% of newborns with hearing loss. Such loss may emerge in the prenatal, perinatal, or postnatal periods. Risk factors in the prenatal period include genetic factors, congenital infections, trauma, ototoxic drug use, radiation, and some systemic diseases. Risk factors in the perinatal period include prematurity, low birth weight, history of admission to intensive care, asphyxia, infections, head trauma during birth, blood exchange, and blood incompatibility. Postnatal period risk factors include infections, head trauma, genetic diseases, seizures, craniofacial anomalies, ototoxic drugs, and idiopathic causes. Hearing loss rates increase in line with numbers of risk factors (1).

Of the newborns in this study, 69.2% passed the first ABR tests. Rates of 74.74% were reported by Ulusoy et al. (2), 74.5% by Ahmad et al. (8), and 76.9% by Kucur et al. (9). Amniotic fluid remaining in the outer ear after birth can lead to false results. The ideal recommended screening test is therefore performed 24 h after birth or immediately prior to discharge. In addition, babies become more active and begin producing sounds at the end of the first month. It is therefore recommended that screening tests be completed within 30 days (2). The hearing

screening program as therefore applied in that manner in the present study.

Hearing loss rates of 0.08% and 0.3% have been observed in hearing screening programs performed in three stages in different regions of Turkey (1). Rates of 0.15% were reported by Kucur et al. (9), 0.27% by Celik et al. (10), 0.93% by Koseoglu et al. (11), and 0.2% by Kaplama et al. (1). Consistent with the previous literature, a unilateral hearing loss rate of 0.103% a bilateral hearing loss rate of 0.059%, and a total hearing loss rate of 0.162% were detected in the present study.

CONCLUSION

The first year of life is the most critical period for speech and language development. It is very important for hearing loss, a significant public health problem, to be detected via screening tests in the first three months and for treatment and rehabilitation to be started within six months at the latest. These babies can thus acquire normal hearing and not lag behind their peers in terms of linguistic, social, and cognitive skill development.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Kastamonu University Clinical Research Ethics Committee (Date: 23.06.2021, Decision no: 2020-KAEK-143-102).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

Acknowledgements: We want to thank to Mr. Carl Austin Nino Rossini for his precious contribution.

REFERENCES

- Kaplama ME, Yukkaldiran A, Ak S. Newborn hearing screening results: Comparison of Syrian and Turkish newborns; factors influencing the difference. *Int J Pediatr Otorhinolaryngol* 2020; 138: 110390.
- Ulusoy S, Ugras H, Cingi C, Yilmaz HB, Muluk NB. The results of national newborn hearing screening (NNHS) data of 11,575 newborns from west part of Turkey. *Eur Rev Med Pharmacol Sci* 2014; 18: 2995-3003.
- Bolat H, Bebitoglu FG, Ozbas S, Altunsu AT, Kose MR. National Newborn Hearing Screening Program in Turkey: Struggles and implementations between 2004 and 2008. *Int J Pediatr Otorhinolaryngol* 2009; 73: 1621-3.
- Joint committee on infant hearing 1994 position statement. American Academy of pediatrics joint committee on infant hearing. *Pediatrics* 1995; 95: 152-6.
- 52nd WMA General Assembly. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA* 2000; 284: 3043-9.
- American Academy of Pediatrics. Newborn and infant hearing loss: detection and Intervention. *Pediatrics* 1999; 103: 527-30.
- Rivera AS, Lam HY, Chiong CM, Reyes-Quintos MRT, Ricalde RR. The costeffectiveness and budget impact of a community-based universal newborn hearing. *Screen Progr Philippines* 2017; 5: 1-8.

8. Ahmad A, Mohamad I, Mansor S, Daud MK, Sidek D. Outcome of a newborn hearing screening program in a tertiary hospital in Malaysia: the first five years. *Ann Saudi Med* 2011; 3: 24-8.
9. Kucur C, Kınıs V, Ozdem S, Kucur SK. Newborn hearing screening results at Zeynep Kamil women and children diseases education and research hospital, *Kulak Burun Bogaz Ihtis Derg* 2012; 22: 38-42.
10. Celik IH, Canpolat FE, Demirel G, Eras Z, Sungur VG, Karaer B, Zekai Tahir Burak women's health education and research hospital newborn hearing screening results and assessment of the patients. *Türk Ped Ars* 2014; 49: 138-41.
11. Koseoglu S, Derin S, Bozkurt S, Sahan M, Ucuncu H. Mugla Sıtkı Kocman Universitesi eğitim ve araştırma hastanesi yenidoğan isitme taraması sonuçları. *Turk J Pediatr Dis* 2017; 11: 5-8.