

Neonatal Hearing Screening: failures, hearing loss and risk indicators

Raquel Mari Onoda¹, Marisa Frasson de Azevedo², Amélia Miyashiro Nunes dos Santos³

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Abstract

To check the rate of failure, hearing loss and its association with demographic variables and risk indicators for hearing loss in newborns submitted to the Newborn Hearing Screening in a secondary hospital.

Materials and Methods: Cross-sectional and retrospective study, involving 1,570 newborns submitted to the different stages of the Newborn Hearing Screening Program. Initially, we carried out otoacoustic emission tests (ILO Echocheck) and the cochlear-eyelid reflex. Afterwards, we analyzed the demographic and clinical characteristics of the newborns, screening rate of failure, hearing loss and its association with demographic variables and risk indicators.

Results: Twenty-six newborns had failures in the first stages of the Program (1.7%), who were then referred to diagnostic evaluation. Of these, 16 (61.5%) did not come, two (7.7%) had normal results and eight (30.8%) were diagnosed with hearing disorders. The screening failure rate was 1.7% and the frequency of hearing disorders was 0.5%.

Conclusions: Pre-term newborns of very low birth weights had higher rates of screening failures and a greater occurrence of hearing changes. The factors associated with screening failure and hearing changes were similar to the ones described in the literature.

¹ MSc, Speech and Hearing Therapist.

² PhD; Professor at the Department of Speech and Hearing Therapy.

³ PhD; Professor at the Department of Pediatrics.

Send correspondence to: Raquel Mari Onoda - Rua dos Lírios, 195, apto. 82, Mirandópolis, São Paulo - SP. CEP: 04047-040.

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INTRODUCTION

Hearing loss is one of the most common sensorial disorders. A clinically significant hearing loss may affect 1-3 for every 1000 low-risk newborns^{1,2}; and among newborns in the ICU this rate can reach 2% to 4%^{3,4}.

After analyzing the literature, COMUSA (Multi-disciplinary Committee on Hearing Health), made up by otolaryngologists, pediatricians, speech and hearing therapists, and other professionals, made 21 recommendations for early identification, diagnosis and treatment of newborns and infants with hearing impairment⁵.

In the present study we tried to analyze the demographic and clinical characteristics of the newborns who participated in the Neonatal Hearing Screening Program in a secondary level maternity, identifying the level of failure and the occurrence of hearing loss and its association with the following variables: gestational age, birth weight and neonatal clinical occurrences.

MATERIALS AND METHODS

This was a retrospective study in which we collected the results from the Neonatal Hearing Screening Program implemented in the Neonatal Unit of a Municipal Hospital located in the north of the city of São Paulo, SP. The annual number of live births, seen in the Neonatal Unit in this hospital is around 1,500; with rates of low-birth weight (birth weight <2,500g) of 11%; very low birth weight (birth weight <1,500g) rate of 1.6% and of extreme low birth weight (birth weight <1000g) rate of 0.8%.

In the study, we included the newborns whose hearing screenings were done by the author, during 20 months, between February of 2004 and December of 2006.

This project was submitted to and approved by the Ethics in Research Committee under protocol # 1332/06.

The Neonatal Hearing Screening (NHS) was carried out by means of Transient Stimulus Evoked Otoacoustic Emissions (TEOE) and the Cochleo-eyelid Reflex (CER) by means of an agogô musical instrument (large campanula) at 100 dB SPL of intensity.

TEOE was carried out in both ears using the ILO EchocheckT system, a portable device which uses click stimuli involving frequency bands between 1,500 Hz and 3,800 Hz. The click is presented at an intensity of 75 to 83 dBpeSPS. The response was considered positive (pass) when the otoacoustic emissions captured were 6 dB higher than the noise.

CER happens in 100% of normal hearing children and its lack suggests bilateral hearing loss or central

disorder. The study is carried out with an intense sound stimulus and the response is considered present when there is a contraction of the eye's orbicular muscle, seen by eyelid movement.

The newborn who failed the screening was submitted to a complete audiological evaluation for diagnostic purposes. The assessment was based on the study of the TEOE, acoustic immittance measures obtained by the AZ7 immittance meter with a 226 hertz probe for the tympanometric curve, behavioral assessment and brainstem Hearing evoked potential (BAEP), with the Navigator Pro-Biologic Systems Corp[®] device with a click-type stimulus.

The children who had risk indicators for hearing impairment, even those who passed the hearing screening, were referred to Hearing development follow up.

The hearing loss was classified as conductive when associated with middle or external ear disorders; or sensorineural, associated with cochlear disorders classified as mild to profound degree⁶, or retrocochlear, because of a hearing neuropathy or neural conduction changes in the brainstem Hearing pathways.

As far as the demographic characteristics of the children included in the study are concerned, we observed the following data: newborn gender, birth weight, gestational age and Apgar score.

Concerning hearing impairment risk analysis, we collected the following variables: consanguinity, congenital malformations, perinatal asphyxia, hyperbilirubinemia, peri-intraventricular hemorrhage, meningitis, seizures, need for mechanical ventilation, use of ototoxic medication, congenital infections such as syphilis, rubella, toxoplasmosis, cytomegalovirus and human immunodeficiency virus (HIV) diagnosed during gestation or in the neonatal period, smoking, alcohol drinking or the use of illegal drugs during pregnancy; family with hearing loss, diagnosis or suspicion of genetic syndromes made by the pediatrician and/or geneticist, duration of neonatal ICU stay.

We analyzed demographic and clinical characteristics of the newborns included in this study and the rate of failure in the screening, the occurrence of hearing loss and an association between failure in the test and gestational age, birth weight and the main neonatal complications.

The results obtained were described as mean and standard deviation of the numerical variables and frequency for the categorical ones. The investigation concerning the factors associated with otoacoustic emission test failure was carried out by means of a univariate analysis, using the chi-squared or Fisher's test, considering $p < 0.05$ as significant.

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