MONITORING FOR NEWBORN HEARING SCREENING PROGRAMMES: AN INTEGRATIVE REVIEW

Acompanhamento em programas de saúde auditiva infantil: uma revisão integrativa

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ABSTRACT

In Brazil, hearing loss diagnosis does not occur in early years. Among various factors that could explain this fact is that the parents do not know well about hearing health for their children, and then do not attend for the follow-up. This literature review had as main goal to describe how the follow up has been done in Brazil, especially regarding to the audiologic exams, regarding to the follow up by the family, and regarding to educations activities for the health professionals. In order to achieve that, an integrative review of the literature was done, leaded by the question: How the audiologic follow up has been done for the newborn hearing screening programs? It was used the the following databases: Lilacs, Medline, IBECS and CidSaúde using combinations of the terms "follow-up studies", "hearing" and "newborn screening". Initially, 1130 articles were screened by titles and abstracts. Then, 21 full articles were pre-selected by title and summary. Twelve articles answered the question of this review. The results indicated that tests for hearing screening and audiologic were used more Evoked otoacoustic emissions and auditory brainstem response, and behavioral assessment, tympanometry and acoustic reflexes. Three studies reported the presence of educational programs and only one specified professionals realized that, being the nurse what else made these activities. The percentage of families who joined the monitoring varied considerably. It was interesting to see that those recommendations from local and international entities to perform the audiologic, seeking a standard of quality and effectiveness in the programs and the quality of the audiological evaluation.

KEYWORDS: Hearing; Neonatal Screening; Newborn; Infant

INTRODUCTION

Newborn Hearing Screening (NHS) allows the detection of possible hearing problems in neonates and infants, enabling the diagnosis of hearing loss before the third month so that intervention can occur before six months of age, as recommended in national and international literature[1,2], in order to avoid significant delays in the language development of these children, if they are not diagnosed[3,4].

Since 1994, the Joint Committee on Infant Hearing (JCIH) has recommended conducting the Universal Newborn Hearing Screening (UNHS), or in other words, hearing screening for all newborn babies[2], as well as the identification of those who have risk indicators for hearing loss[5,6], fundamental to the existence of the monitoring protocol of at-risk neonates or infants. All these recommendations serve to guide public health actions in order to prevent and educate the public regarding the hearing health care.

Despite of the importance of having intervention as early as possible, the diagnosis of hearing loss in Brazil is tardy, occurring around the age of 3-4

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and taking up to two years to complete[7]. One of the factors that may explain this late identification, even with numerous implemented hearing screening programmes, could be the families' lack of adhesion. In other words, they do not attend the audiological monitoring when there is referral, and consequently, do not complete the hearing evaluation of the child. Thus, it is necessary to realise audiological monitoring and observe how this is being conducted in Child Hearing Health Programmes in Brazil, so that this reality can be changed.

The need to ensure auditory monitoring of infants with risk indicators comes from the increased possibility of late onset or progressive hearing loss in these individuals. Some factors may contribute to this monitoring, bringing improvements to the effectiveness of the child hearing health programme, such as investment in guidance to families about the importance of listening to language development, to improve their adherence to audiological monitoring and consequently provide the diagnosis of possible hearing loss[1,4,8]. In certain cases, even without the presence of risk indicators, the family should return to the programme after hearing screening for other hearing tests of the child in order to complete the diagnosis.

Considering this context, some proposals may be used for greater involvement of the various health professionals in Child Hearing Health Programmes, for greater awareness of the risk indicators that may be related to hearing loss, highlighting educational activities. Thus, it is recommended to invest in the transformation of the knowledge of professionals who deal with newborns and infants, so they may act as a multiplier of knowledge for the families, besides identifying the need for referral to a hearing evaluation service. Educational programmes have proven to be useful for subsidizing practices directed to health professionals, making them agents of individual and collective changes in the families' bio psychosocial context. Therefore, these professionals assume the role of facilitators of the population's health education process[9,10].

Thus, it is important to investigate the audiological monitoring in Child Hearing Health Programmes. For that reason, it was decided to carry out an integrative review, aiming to describe how audiological monitoring is being conducted in Child Hearing Health Programmes in Brazil, especially addressing the tests conducted, the adherence of families to audiological monitoring and developed educational actions.

METHODS

This study consists of an integrative literature review, a method that allows the incorporation of evidence into practice and aims to gather and synthesize research results on a defined topic or issue in a systematic and orderly fashion, helping to further the knowledge about the investigated topic[11]. The elaboration of the integrative review followed six stages: preparing the guiding question, 2) searching or sampling the literature, 3) data collection, 4) critical analysis of the included studies, 5) discussion of the results and 6) presentation of the integrative review[12].

To achieve the objective of this review, the following guiding question was prepared: how is audiological monitoring being conducted in the Child Hearing Health Programmes in Brazil?

For the article survey in the literature, an online search was conducted in January 2013 in the following databases: Latin American and Caribbean Centre on Health Sciences (LILACS), Medical Literature Analysis and Retrieval System Online (MEDLINE), Spanish Bibliographic Index on Health Sciences (IBECS) and Literature on Healthy Cities / Municipalities (CidSaúde).

In the article search all possible combinations between the free term "monitoring" and controlled descriptors "hearing" and "neonatal screening" were used, found via Descriptors in Health Sciences (MeSH). The search results by combining descriptors ("hearing" and "newborn screening" and "monitoring", "hearing" and "newborn screening", "hearing" and "monitoring", "newborn screening" and "monitoring") according to the database can be seen in Table 1.

After the search, 1130 publications were identified, of which 186 were found in the LILACS, 15 in IBECS, 929 in MEDLINE and none in CidSaúde.

Of this total, only articles that met the following criteria were included: articles published in Portuguese, English and Spanish; articles published up to the year 2012, without a minimum time limit; articles approaching the audiological monitoring of neonates and infants in a Child Hearing Health Programme in Brazil. Excluded were: studies that addressed only the monitoring in intervention stages or in cases of diagnosed hearing loss; publications that were not original research articles, such as informal case reports, book chapters, dissertations, theses, reports, news, editorials, unscientific texts. Articles that appeared in more than one database were counted only once.

Table 1 - Publications found from the combination of descriptors, according to the database. Recife, 2013

Descriptors	Lilacs	Ibecs	Medline	CidSaúde	Total of publications
"hearing" and "newborn screening" and "monitoring".	6 articles	0 articles	10 articles	0 articles	16
"hearing" and "newborn screening".	72 articles	14 articles	841 articles	0 articles	927
"hearing" and "monitoring".	83 articles	1 article	40 articles	0 articles	124
"newborn screening" and "monitoring".	25 articles	0 articles	38 articles	0 articles	63
TOTAL	186 articles	15 articles	929 articles	0 articles	1.130

The titles and abstracts of 1130 articles were read to verify their suitability for inclusion criteria, and thus their suitability to the study's theme. From this pre-selection, 21 articles remained, which were then read in their entirety in order to measure their suitability to the theme of audiological monitoring in a Child Hearing Health Programme in Brazil. After reading the full texts, it was ascertained that 12 items responded to the question posed in this review. It is worth noting that at this stage of the selection meetings were held between the study's authors to clarify doubts regarding the inclusion or exclusion of studies. This procedure aimed to reduce bias in selection, giving it greater safety and accuracy.

To assess the methodological rigor of the 12 selected studies, the adapted version of the Critical Appraisal Skills Programme (CASP) was used, composed of 10 items: objective, methodological adequacy, presentation of theoretical and methodological procedures, sample selection, data collecting procedure, the relationship between researcher and subjects, consideration of ethical aspects, data analysis procedure, presentation of results and significance of the research. For each item cited, a value of 0 (zero) or 1 (one) was assigned, with the end result being represented by the sum of the scores, with a maximum score of 10 points[13].

The selected articles were classified according to the scores: level A – 6 to 10 points (good methodological quality and reduced bias) or level B – up to 5 points (satisfactory methodological quality, but with increased risk of bias). At the end of the evaluation, all studies were classified as level A, and remained in the sample.

After the classification process, the data collection for these 12 selected articles was carried out, and the following information extracted: the database where it was indexed; title, authors, journal, year of publication, language; article's objectives; population or entity studied; level of evidence; methodological characteristics; audiological monitoring information. This was followed by a discussion on the selected studies for this integrative review presentation.

The results are part of the review of 12 original research articles that met the review criteria and were of good quality and methodologically rigorous. All selected publications have quantitative methodology.

The articles were also classified according to the 7 Levels of Evidence[14], with 2 of them falling into evidence level 4 and the 10 remaining into level 6.

In Figure 1 the characteristics of the articles selected for this integrative review are presented.

Database	Reference (title, authors, journal, language, year of publication)	Objective (s) of study / Methodological characteristics (type of study, study population or entity, etc.) / Level of Evidence	Information on audiological monitoring
Lilacs	Triagem auditiva neonatal: motivos da evasão das famílias no processo de detecção precoce. [Newborn hearing screening: reasons for circumvention of families in the process of early detection.] Kátia de Feitas Alvarenga; Juliana Maria Gadret; Eliene Silva Araújo; Maria Cecília Bevilacqua. Revista da Sociedade Brasileira de Fonoaudiologia. Português. 2012.	- To analyse the reasons for family dropout from a screening program conducted in a public hospital and to correlate them with the demographics of families and the characteristics of the program. Prospective study. Conducted through interviews via telephone calls to families whose children were born in a maternity hospital in the state of São Paulo and had not appeared for screening or for retest (audiological monitoring). Level of Evidence: 6 .	- The hearing evaluation is performed with the Transient Evoked Otoacoustic Emissions test (TEOAE) and occurs in two steps: screening and retest (audiological monitoring) of those who obtained the result 'failed' in the screening. - Orientation is made about the importance of hearing assessment with mothers still in bed, before hospital discharge. - Monitoring is scheduled for the same day of the Guthrie test. - Reasons given by families to justify evasion: lack of knowledge about the hearing screening, financial difficulties, difficulties in reconciling the schedule with the family routine, disinterest, lack of scheduling and others (emotional factors, the fact of having received advice of the pediatrician claiming screening is unnecessary, etc.). - No association found between reasons for evasion and work area of professionals which provided guidance. - As for the professionals that explained about hearing evaluation: 41% reported having been the nurse, 5% the speech therapist, 4% the doctor, 27% received no counseling and 23% were unable to answer.
Lilacs	Implementação do programa de triagem auditiva neonatal universal em hospital universitário de município da região Sul do Brasil: resultados preliminares. [Implementation of the universal newborn hearing screening program in a university hospital in a southern Brazil town: preliminary results] Marina Faistauer; Tássia Alicia Marquezan Augusto; Marilise Floriano; Camila Correa Tabajara; Claudia Mahfuz Martini1; Viviane Bom Schmidt; Renato Roithmann. Revista da Associação Médica do Rio Grande do Sul. [Journal of the Medical Association of Rio Grande do Sul] Português. 2012.	- To present the results of the OAE test in a referral hospital in a southern Brazil city during 11 months of implementation of the newborn hearing screening protocol. Transversal observational study performed at the NHS of a tertiary hospital responsible for performing the OAE test in all neonates in a city with approximately 300,000 inhabitants. The protocol used to perform the screening is that determined by the Health Department of the State of Rio Grande do Sul in April 2010 and follows the rules of NHS. Level of Evidence: 6.	- TEOAE test was performed by a speech therapist in the NHS. - When the child got a "failure" result, a second TEOAE examination was scheduled in 15 days, to be held in the hospital Speech Therapy sector, using the same device of the first screening. - Babies with 'pass' result in the second test were referred for evaluation and tests at the Department of Otorhinolaryngology at the same hospital, including: child audiometry, immittanciometry and Brainstem Auditory Evoked Response (BAEP) test. These examinations were performed by two other speech therapists from the same Speech Therapy sector. - After the team diagnosis, and when indicated, the fitting of the neonate was held by the hearing health sector of the same institution.

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Lilacs	Programa de triagem auditiva neonatal: resultados de um Hospital Universitário de Porto Alegre. [Neonatal hearing screening program: results of a Porto Alegre University Hospital] Mara Salete Canabarro; Neli Machado; Vera Fossa; Kátia Maria Weiss; Edson Ibrahim Mitre. Revista HCPA. Português. 2012.	1) To present the results of the newborn hearing screening program of the hospital; 2) To verify if it is within the recommendations of the Brazilian Committee on Hearing Loss in Children (CBPAI) to UNHS. Observational, analytic and retrospective cross-sectional study. Tests performed from June 2009 to June 2011 on all newborns in the rooming maternity and neonatology units were analyzed. These tests were stored in the hearing screening sector's computer database. Level of Evidence: 6.	- Retest in 15 days with the same protocol of NHS (Distortion Product Otoacoustic Emissions (DPOAE)), before hospital discharge or 48 hours of life). - In case of "failure" result in the retest, there was referral to the Otolaryngology outpatient clinic for early medical evaluation and speech specialist.
Lilacs	Participação das famílias em Programas de Saúde Auditiva: um estudo descritivo. [Participation of families in Hearing Health Programs: a descriptive study.] Kátia de Freitas Alvarenga; Maria Cecília Bevilacqua; Tatiana Mendes de Melo; Andréa Cintra Lopes; Adriane Lima Mortari Moret. Revista da Sociedade Brasileira de Fonoaudiologia. [Journal of the Brazilian Society of Speech Therapy] Português. 2011.	To assess parents adherence to a Children's Hearing Health Program linked to the community, in the city of Bauru, São Paulo. An observational, cross-sectional study. Population composed of children from birth to one year of age, born in the city's Public Maternity Hospital and monitored by the Community Health Agents Program (PACS) or by Family Health teams who participated in the Hearing Health Training Program proposed in the Model Project on Infant Hearing Health within the Family Health Program (SAÚDI) in three different districts of the city of Bauru (SP) in the period from February to March 2007. Level of Evidence: 6.	- Attendance of the families in the Basic Health Units was less than half of those who were invited to the audiological evaluation, covering 40.61%. - The initial expectation of the professionals involved was to obtain a more effective family attendance, due to the conditions in which it was developed: no cost to the family; scheduling performed by community health agents (CHA) during home visits; audiological evaluation at the family's residence Health Centre district and during the weekends, which in principle should increase attending rates, as there would be no job losses for parents or guardians. - Considering that the Program was developed at the district's Health Department in which the family resides, and working during weekends, it seems that the lack of financial resources would not be a justification for the non-attendance of these families. - The community's lack of knowledge about the importance of hearing for children's overall development, as well as about the risk factors for hearing loss, may be the predominant factor in this situation. - Children were referred for audiological evaluation, which was done in order to validate the questionnaire for monitoring children's development of hearing and language, in children up to one year, for subsequent use by the Family Health Teams. The audiological evaluation proposed by the SAÚDI project was carried out by a speech therapist, besides otolaryngological evaluation.

Database	Reference (title, authors, journal, language, year of publication)	Objective (s) of study / Methodological characteristics (type of study, study population or entity, etc.) / Level of Evidence	Information on audiological monitoring
Lilacs	Acompanhamento do desenvolvimento da função auditiva em crianças sem e com indicadores de risco para a surdez. [Monitoring the development of auditory function in children with and without deafness risk factors.] Dayane D. Didoné; Letícia R. Kunst; Tainara M. Weich; Ana C. Ourique; Cacineli M. de Franceschi; Tania Tochetto. Distúrbios da Comunicação. Português. 2011.	To report the occurrence of risk indicators for hearing loss and compare the results of behavioral assessments performed during the monitoring phase of children's auditory function development, with and without risk factors, considered to have normal hearing in the NHS, aged six to 32 months old. The study included 159 children of both sexes, 66 with and 93 without risk indicator for hearing loss, born in the University Hospital of Santa Maria, submitted to NHS and considered to have normal hearing and which were re-evaluated between six and 32 months of age to access the maturation of the auditory pathways in the follow-up phase of the auditory function development. Level of Evidence: 6.	- Risk factors for hearing loss were investigated. - All infants were referred for evaluation of the auditory pathways maturation, between 6 and 32 months of age. - The call for audiological monitoring was made at the time of NHS. Patients were scheduled according to the available positions, which explains the variation in the study's age group. - Children who presented delay in the maturation stages of the auditory pathways were reassessed after a certain period and when the response was still not satisfactory for the age group, they were referred to the language sector of the Speech Therapy Service. - Transient Evoked Otoacoustic Emissions (TEOAE) and Cochlear-eyelid Reflex (CER) were surveyed in the NHS using the musical instrument *agogô*. - During the evaluation of the auditory pathways maturation, children underwent observation of behavioral responses to uncalibrated sounds (through instruments such as bell and clapper) below and above 90 dB-SPL and to calibrated sounds (warble tone).
Lilacs	Adesão a um Programa de Triagem Auditiva Neonatal. [Adherence to a Newborn Hearing Screening Program] Maria de Fátima de Campos Françozo; Gabriela Abrahão Masson; Tereza Ribeiro de Freitas Rossi; Maria Cecília Marconi Pinheiro Lima; Maria Francisca Colella dos Santos. Revista Saúde e Sociedade. [Health and Society Magazine.] Português. 2010.	To characterize the adherence rates of infants to NHS program. Cross-sectional study. Research conducted on medical records of all infants who attended the screening in the period from February to November 2007. Level of Evidence: 6.	- Hearing evaluation takes place in three stages: screening by TEOAE scheduled or before discharge from maternity ward, retest (audiological monitoring) by Brainstem Auditory Evoked Potential (BAEP) of those who obtained the 'failure' result in screening and audiological and otolaryngological diagnostic procedures (not specified in the article). - Risk indicators for hearing loss are assessed, but its applicability in the program is not established. - Before the screening examination, mothers and newborns and infants caregivers participate in a steering group on the hearing screening, under the responsibility of speech therapists and social workers. - In the case of 'failure' result in the evaluation, the mothers receive guidance about their concerns on the test result and about the following procedures, emphasizing the importance of the assessment continuity in order to proceed to rehabilitation. - In some cases and by social study, the Social Service provides bus passes for mother's return, or verifies with them other situations that may hinder their return. In cases where the child missed the scheduled screening or perform the test but did not return to audiological monitoring, the social worker contacts the parents or guardians to verify reasons for non-attendance, thus initiating a process that aims to ensure the completion of procedures. - The rate of adherence to screening reached 62.17% in the first stage and 79.34% in the second.

Database	Reference (title, authors, journal, language, year of publication)	Objective (s) of study / Methodological characteristics (type of study, study population or entity, etc.) / Level of Evidence	Information on audiological monitoring
Lilacs	Detecção de perdas auditivas em neonatos de um hospital público. [Detecting Newborns Hearing Loss in a Public Hospital.] Maria Cecília Marconi Pinheiro Lima; Tereza Ribeiro de Freitas Rossi; Maria Fátima de Campos Françozo; Sérgio Tadeu Marba; Gisele Marafon Lopes de Lima; Maria Francisca Colella dos Santos. Revista da Sociedade Brasileira de Fonoaudiologia. [Journal of the Brazilian Society of Speech Therapy]. Português. 2010.	To analyse the results obtained in the NHS performed through two procedures, TEOAE and Automated Brainstem Auditory Evoked Potential (A-BAEP) in a population of healthy neonates in a public hospital, considering both genders and the side in which the failure occurred. Clinical, prospective, cross-sectional study. The sample consisted of full-term, appropriate for gestational age newborns, born in the Unicamp CAISM [Maternity Hospital], which remained in rooming due to good health condition. Level of Evidence: 4.	- At discharge, a day is scheduled for hearing screening. - At the time of screening, the mothers answered a questionnaire with questions about the presence or absence of risk indicators. - The neonates were screened by TEOAE. - In case of screening 'failure' result, neonates were referred for retesting by. - Neonates with 'failure' result on A-BAEP screening were referred for the audiological diagnosis in other community health services. - Infants with 'pass' result on TEOAE but which presented risk indicators were booked at the Audiological and Language Monitoring Program, in which infants and/or children are followed until 24 months of age. - 628 neonates were referred to retest, of which only 223 (35.5%) returned for screening by A-BAEP.
Lilacs	Caracterização da triagem auditiva neonatal da Clínica Limiar em Porto Velho - Rondônia. [Characterization of neonatal hearing screening at Clinica Limiar in Porto Velho - Rondônia.] Marilia Silva e Nunes Botelho; Virgínia Braz da Silva; Luana da Silva Arruda; Isabel Cristiane Kuniyoshi; Lourdes Lebre Redes de Oliveira; Anderson Souza de Oliveira. Brazilian Journal of Otorhinolaryngology. Português. 2010.	To characterize the NHS program developed by Clínica Limiar in Porto Velho-RO. Historic longitudinal cross-section study. Data were collected in the database of the Hearing Assessment and Rehabilitation Clinic - LIMIAR, from February 2004 to October 2006, with a sample of 6889 registered patients, treated at the Base Hospital Dr. Ary Pinheiro. Level of Evidence: 4.	- Newborns (NB) with result of 'failure' in the screening were referred for retesting; if the 'failure' result remained, they were referred for audiological diagnosis. - The protocol used in this study was suggested by GATANU (Support Group for NHS): screening by TEOAE (step 1), and if the result is 'failure', retest in 15 to 30 days (step 2). The newborns that still obtain 'failure' result would be referred for diagnostic services for ENT evaluation, BAEP, immittanciometry and Behavioral Assessment.
Lilacs	Prevalência de alterações auditivas em crianças de risco. [Prevalence of hearing loss in children at risk.] Fernanda Alves Botelho; Maria Cândida Ferrarez Bouzada; Luciana Macedo de Resende; Cynthia Francisca Xavier Silva; Eduardo Araújo Oliveira. Brazilian Journal of Otorhinolaryngology. [Brazilian Journal of Otorhinolaryngology.] Português. 2010.	1) To verify the prevalence of hearing impairment; 2) To correlate the risk indicators in neonates, born and monitored in a tertiary hospital. Descriptive and cross-sectional study. Newborns weighing less than or equal to 1.500g and/or with gestational age up to 34 weeks, hospitalized in the Neonatal Unit of a referral hospital, which were followed-up after discharge from June 2006 to July 2008. Level of Evidence: 6.	- In case of 'failure' results in the NHS a revaluation was held through DPOAE. - The diagnosis used immittanciometry and BAEP tests. Upon diagnosis of hearing loss the patient was referred for intervention.

Database	Reference (title, authors, journal, language, year of publication)	Objective (s) of study / Methodological characteristics (type of study, study population or entity, etc.) / Level of Evidence	Information on audiological monitoring
Lilics	Potencial Evocado Auditivo de Tronco Encefálico: padrão de respostas de lactentes termos e prematuros. [Brainstem Auditory Evoked Potentials: response pattern of term and preterm infants.] Raquel Leme Casali; Maria Francisca Colella dos Santos. Brazilian Journal of Otorhinolaryngology. Português. 2010.	To analyze the pattern of responses of neonates and term and premature infants for the BAEP, considering the factors gender and ear, and to verify the influence of the auditory pathways maturation in the electrophysiological responses of this population. Cross-sectional and prospective study. 66 children of both genders were evaluated, with 36 term infants (FTN) and 30 premature, according to the classification of the World Health Organization (WHO). All subjects in this study remained in rooming and, with the exception of prematurity, did not present any other risk factor for hearing loss. Level of Evidence: 6	- All newborns and infants had to have a 'pass' result in newborn screening, and present only prematurity as a risk indicator. - The evaluations were performed between hospital discharge and 3 months of life and were made by the following: anamnesis, analysis of the middle ear with acoustic impedance and electrophysiological evaluation through BAEP. - In order to exclude peripheral auditory disorders of external and middle ear, only infants with a 'pass' result in the NHS performed with the use of TEOAE were enrolled and which tympanometry showed no alterations.
Lilacs	Triagem auditiva neonatal: incidência de deficiência auditiva neonatal sob a perspectiva da nova legislação paulista. [Newborn hearing screening: incidence of neonatal hearing loss from the perspective of the new São Paulo legislation.] Khalil Fouad Hanna; Roberto Alcântara Maia. Revista Brasileira de Saúde Materno Infantil. [Brazilian Journal of Mother and Child Health.] Português. 2010.	The aim of this study is to identify the incidence of newborns with hearing impairment, without risk indicators for hearing loss, in a regular nursery in a private maternity hospital in the city of São Paulo. A cross-sectional study was conducted, in the period of 06 January 2004 to 30 December 2008 in a private maternity hospital located in the southern area of São Paulo, which voluntarily started the NHS test in 1999. It is a maternity hospital that serves pregnant women with health insurance plans, from various private health plans. 45,550 newborn parents were guided about the NHS. From these parents, 20,615 agreed to perform the NHS. Level of Evidence: 6.	- 45,550 parents of newborns received guidance about the NHS. From these parents, 20,615 agreed to perform the NHS (TEOAE). The newborns were of both sexes, from normal nursery, without risk indicators for hearing loss and were not in the Neonatal Intensive Care Unit (NICU). - For tests with a 'failure' result a new TEOAE test was held after approximately two weeks. - Infants who obtained a 'pass' result in the second examination were discharged. Those with a 'failure' result were referred to BAEP testing conducted in laboratories indicated by the maternity hospital.
Lilacs	Análise da implantação de programa de triagem auditiva neonatal em um hospital universitário. [Analysis of the implementation of a newborn hearing screening program in a university hospital.] Wilian Maduell de Mattos; Luciana Ferreira Cardoso; Clarice Bissani; Maria Madalena C. Pinheiro; Carla Mherlyn Viveiros; Waldir Carreirão Filho. Revista Brasileira de Otorrinolaringologia. [Brazilian Journal of Otorhinolaryngology.] Português. 2009.	1) To characterize the process of implementing the NHS program in a University Hospital; 2) To analyze the diagnostic investigation of hearing loss in newborns; 3) To present proposals aiming to improve newborn hearing screening. Cross-sectional study. The subjects were all newborns who underwent hearing screening examination between March and August 2005. Level of Evidence: 6.	- TEOAE and behavioral assessment through CER using the musical instrument *agogô*. were used for the hearing screening, near the discharge of the neonate. - Neonates untested and discharged on weekends and/or holidays were referred and scheduled for evaluation within two to four weeks of life. - In case of alteration in the hearing screening or if the neonate presented risk indicator for hearing loss, the tests would be repeated in the second stage of the program, between 7 and 15 days after discharge, and middle ear assessment by tympanometry was performed. These patients would then be referred for medical evaluation that would indicate the need for further examination. - When indicated, the infant would pass to the third stage of the research, being evaluated by BAEP test.

LITERATURE REVIEW

Among the findings on the characteristics of the Hearing Health programmes described in the articles, the following issues for discussion were identified: tests performed to assess hearing, adherence to audiological monitoring and educational activities that promote audiological monitoring.

Tests performed for screening and audiological monitoring in the programmes referred to in this review's articles were principally the TEOAE and the BAEP, although also cited were Imitanciometry, CER, DPOAE and Behavioural Audiometry.

The Multidisciplinary Hearing Health Committee (COMUSA) outlines some recommendations, one of which refers to methods of hearing assessment, such as the indication of hearing loss identification through hearing screening with sensitive and specific methods, recommending the use of electrophysiological (BAEP) and/or electroacoustic (EOAE register– by Transient Stimulus or Distortion Product) measures[15].

The Otoacoustic Emissions test (OAE) is highly sensitive, faster than the BAEP, taking approximately one minute per ear, simple, easy to apply and interpret and has been highly recommended for NHS. The downside is that it does not identify retrocochlear changes, common in Intensive Care Unit (ICU) neonates, and suffers greater interference in case of disorders of the external ear (e.g. vernix) and middle ear (e.g. otitis). The association of the two screening procedures (OAE and BAEP) in the NICU has already been recommended by the National Institute of Health for babies who obtain result 'failure' in the OAE, before hospital discharge[16].

In its latest publication, JCIH (2007) recommended the inclusion of BAEP in neonates who remain in the NICU for more than 5 days, associated with the OAE exam[2]. The two-step protocol, with OAE + BAEP in automatic equipment, has the advantage of identifying retrocochlear alterations, thus more suitable for high-risk populations. This association brings disadvantages as the higher cost and longer for NHS, about 10 minutes[16].

Alvarenga et al proposed the Model Project of Newborn Hearing Health, which consists of performing UNHS in two steps, test and retest, using EOAE. It also ensures an orientation period about the importance of performing NHS, with the mother still in bed, before hospital discharge. The screening is preferably performed before discharge and retest (audiological monitoring), on the day the Guthrie Test is performed at the maternity hospital[17].

COMUSA further states that, in cases of a 'failure' result using the OAE method, it is recommended to use the automatic BAEP before hospital discharge, and/or on the return for retesting, as it can decrease the number of unnecessary referrals for diagnosis. Normal responses in automatic BAEP in both ears should be regarded as satisfactory screening. However, this committee also recommends guidance to parents or guardians in order to emphasize that, in the case of suspected difficulties in the development of auditory skills, a quality hearing care service should be sought immediately[15].

The identification of hearing loss programmes enable diagnosis and intervention over a decisive period for the development of speech. However, for the goals of such programmes to be achieved, the adherence of families at all stages of this process is essential[18].

Different quality indicators are proposed for the Child Hearing Health Programmes, such as the rates of family adhesion and non-adherence. The JCIH proposed/recommended that for a programme to be considered of quality, screening should be performed on at least 95% of newborns, and among those who obtain the result "failure", at least 90% must undertake hearing evaluation by the third month of life[2].

However, the authors have shown great difficulties due to high dropout rates of families at various stages of the hearing health programme, although existing programmes seek to follow these recommendations and achieve these indices[7,19].

In a survey conducted in Massachusetts, in the United States, 11% of children who obtained a 'failure' result in hearing screening did not complete audiological monitoring, i.e. did not return for follow-up[19]. In a study conducted in Italy, there was a loss of 255 (16.46%) of the newborns who did not return to complete the audiological evaluation[20].

A study on the reasons for non-attendance at infant audiological follow-ups pointed to a number of aspects: low parental education, financial difficulties in bringing the child for evaluation, confusion around different postnatal appointments and referrals, and the fact that the mother has more children and observes infant's reactions to sounds in daily life. It is also suggested that mothers' lack of knowledge regarding the right of their children to screening and the impact of deafness on children's speech and language development contribute to the non-adherence. Thus, it is believed that several factors can act as influencers on the adhesion of families of infants to screening programs[21].

In another study, the socioeconomic and demographic factors found for mothers who did not complete the scheduled hearing screening were: mothers who had less than high-school education, who were from low-income families and lived in rural areas outside the city of Recife[22].

There is a clear need for studies that assess demographic and socioeconomic conditions and relate these aspects to the results found in auditory screenings performed in maternity hospitals. Additionally, it is recognised how important are studies that investigate causes and solutions related to the unfavourable socioeconomic conditions identified in the population participating in this type of study[23].

Few programmes cited the adoption of hearing health education as a routine practice, which could work to enhance adherence to audiological monitoring, while the parents or guardians would be empowered in relation to care for the hearing health of their child.

Health promotion underpins a new approach in the context of public health, a radical model of health education, which prioritizes the breaking-down of verticality in the professional-user relationship and recognizes the user as a bearer of knowledge about the health-disease-care process[24].

Empowerment includes promoting awareness and providing information on health and life skills, enabling individual autonomy to make their own choices. The word carries the notions of different fields of knowledge, such as social sciences and health, and is associated with alternative ways of working with social realities[24].

Regarding the professional who conducted health education hearing family members, most were in the Nursing area, confirming the findings in the literature.

Research suggests that the orientation of the doctor or nurse about the need for the exam seems to have motivated mothers to seek the service of hearing evaluation, even if the mother does not quite know what test was taken and what it was for. This behaviour can be justified by the fact that we still live in a society where doctors and some health professionals enjoy much prestige, and their guidelines are followed without question. The effective participation of professionals who make up the hospital staff in the programme can ensure the information to parents regarding the procedures for conducting the screening, highlighting the role of the nursing sector which, in general, is very close to the mothers and babies during their stay in hospital. The programmes can benefit greatly from this partnership[25].

Another important aspect to be considered in Child Hearing Health Programmes is the identification of risk indicators. The identification of risk indicators in newborns and infants treated at a NHS service becomes important for their monitoring, enabling audiological monitoring and targeting preventative actions and promoting hearing health[6].

The JCHI recommends hearing screening for all newborn babies, as well as the identification of those who have risk indicators for hearing loss, which is fundamental for the protocol for monitoring the neonate or infant at risk, given the possibility of late-onset or progressive hearing loss[2,5,6].

CONCLUSION

Audiological monitoring is being carried out in various ways, but with some commonalities amid the studied Infant Hearing Health Programmes.

The most-used tests for hearing screening and audiological monitoring were OAE and BAEP, and in some cases, behavioural assessment, tympanometry and acoustic reflexes were used. The order in which these tests were included in the programmes also varied, while the situations that required monitoring were the result of 'failure' in the screening test and/or the presence of risk indicators for hearing loss.

Families were invited to the audiological monitoring stage at the time of screening. In addition, few took advantage of other hospital activities to promote the returns for audiological monitoring, which would work as a strategy to ensure the family's return to the programme, saving time and taking advantage of a single return to the health centre for multiple purposes.

Few studies have reported the importance or the presence of educational programmes in the Child Hearing Health Programme that could be very useful to improve adherence to audiological monitoring, while elucidating the real need to detect hearing loss and provide intervention as soon as possible. Only one study specified the professionals who conducted educational actions, with nurses being those who most often performed these activities.

The percentage of families who adhered to the audiological monitoring varied considerably in the publications found, meaning this fact may be due to the difference found in the operating of the programmes in question, which were different from each other, as well as those aspects of the study population.

It would be interesting to observe the suggestions and recommendations of local and international entities to conduct audiological monitoring of neonates and infants, so that they seek not only a standard of quality and effectiveness in the programmes, but also the quality of the audiological evaluation, ensuring detection of hearing loss as early as possible. However, each programme can change in order to adapt their actions to the population it serves and its location.

RESUMO

O diagnóstico da perda auditiva no Brasil é tardio. Um dos fatores que pode explicar este fato, mesmo diante de inúmeros programas de triagem auditiva implementados, pode ser a evasão das famílias, não concluindo a avaliação auditiva da criança. Objetivou-se descrever como vem sendo conduzido o acompanhamento audiológico nos Programas de Saúde Auditiva Infantil do Brasil, especialmente em relação aos exames realizados, adesão das famílias ao acompanhamento audiológico e ações educativas desenvolvidas. Realizou-se uma revisão integrativa da literatura, cuja pergunta norteadora foi: como vem sendo conduzido o acompanhamento audiológico nos Programas de Saúde Auditiva Infantil do Brasil? Levantamento nas seguintes bases de dados: Lilacs, Medline, IBECS e CidSaúde, utilizando combinações entre os termos "acompanhamento", "audição" e "triagem neonatal". Inicialmente, os 1130 artigos encontrados foram triados por títulos e resumos. Foram lidas na íntegra as 21 publicações pré-selecionadas por título e resumo, constatando-se que 12 artigos respondiam a pergunta desta revisão. Os exames para triagem auditiva e acompanhamento audiológico mais utilizados foram Emissões Otoacústicas e Potencial Evocado Auditivo de Tronco Encefálico, além de avaliação comportamental, timpanometria e reflexos acústicos. Três estudos referiram a presença de ações educativas nos programas e apenas um deles especificou os profissionais que as realizaram, sendo o profissional enfermeiro o que mais efetuou estas atividades. O percentual de famílias que aderiram ao acompanhamento variou consideravelmente. Acredita-se ser interessante observar recomendações de entidades locais e internacionais para realização do acompanhamento audiológico, buscando um padrão de qualidade e efetividade nos programas e a qualidade da avaliação audiológica.

DESCRITORES: Audição; Triagem Neonatal; Recém-Nascido; Lactente

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