NEONATAL HEARING SCREENING: INDEX REGARDING THE "PASS"/"FAIL" SEX, TYPE OF CHILDBIRTH AND THE TIME OF LIFE

Triagem auditiva neonatal: índice de passa/falha com relação a sexo, tipo de parto e tempo de vida

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ABSTRACT

Purpose: to verify in newborn (NBs) without risk for hearing loss, the "pass/fail" index in the Universal Neonatal Hearing Screening (UNHS), relating them with the sex, childbirth type and time of life. **Method:** characterized as a quantitative, retrospective, sectional and of group study, inserted in the secondary attention to health of a University Hospital, where 1526 NBs handbooks were analyzed, with analyzer of Transients Otoacoustics Emissions (TOAE) model Otoport Lite. It was adopted as inclusion criteria NBs in term of both sexes. It was excluded from the research 355 NBs that presented one of the indicators risk associated to hearing loss, or still, if some of the data collected by the research were incomplete. The sample studied was 1.171 records. **Results:** 88,3% of NBs passed in the first testing. It was not found out significant findings regarding to "pass/fail" index and sex and childbirth type. The NBs that accomplished the testing up to 28 hours after birth fail more frequently, while the ones with more than 32 hours of life pass more frequently. **Conclusion:** the study demonstrated that there was a more appropriate moment for accomplishment of the first testing, where NBs up to 28 hours of life fail more frequently, while the ones with more than 32 hours pass more frequently in the first testing.

KEYWORDS: Audiology; Neonatal Screening; Infant, Newborn

INTRODUCTION

The incidence of bilateral hearing loss is estimated to be between one and three on each thousand of newborn born alive without risk factors[1-3]. This factor contributes to the growing number of countries who are conscious about the need to implement programs of Newborn Hearing Screening (NHS). Currently, the NHS program was implemented as a part of the health system in approximately 55 countries, where the search for improvement is increasing. In Brazil, one of the first programs which focused on NHS was established in 1987 at the University Hospital of Santa Maria, Santa Maria/RS[4]. In 2010, Rio Grande do Sul acquired 40 otoacoustic emission equipment for the realization of the Universal Newborn Hearing Screening (UNHS) offered to the regions with the largest number of alive infant newborns supported by the Unified Health System (SUS), seeking to obey the principle of universality [2].

The UNHS achievement is a strategy to detect early hearing loss, which may affect the life quality of the infant newborn, and should occur until the first month of age. From the early detection, follow up

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and appropriate interventions should happen before six months of life. Researchers say that children that are treated early have a better development in relation to speech, language, school, self-esteem and psychosocial adjustment [5-8].

The Brazilian Committee about Hearing Loss in Children (CBPAI) [1] offers consideration about the technique, stating that failure rates vary from 5% to 20% when screening is performed in the first 24 hours, falling to 3% when carried out between 24 and 48 hours after birth.

Studies show that many factors can affect the results of UNHS. Among them are: gender, gestational age, weight, low lifetime when the test was performed, tendency toward early hospital discharge. All these can increase the chance to the child fail [7,9,10].

So, based on the data described, this study is justified by its contribution to UNHS improvement, helping to reduce the false-positive results. Therefore the aim of this research was to verify, in infant newborns without risk of hearing loss, the rate of pass/fail in UNHS, as well as describe the test results in child without risk of hearing loss, relating them to the lifetime, the type of delivery and gender, in the hospital university in Canoas / RS.

METHOD

This research was approved by the committee in ethic and human research, under the protocol 2010-494H. It was characterized as a quantitative, retrospective, cross-sectional group, being considered as secondary prevention to health.

After approval of the Ulbra university Hospital/ Mãe de Deus, it was analyzed the medical records of 1.526 infant newborns, who were submitted to UNHS via SUS, in the hospital, located in Canoas-RS. It was excluded 355 medical records due to the existence of hearing loss risk and incomplete data.

A total of 1.171 medical records constituted the study sample, being 615 (52,5%) infant male, and 556 (47,5%) infant female, aging between 13,5 and 164 hours.

The TANU was performed daily by a speech pathologist experienced in SUS, in the Ulbra/ Mãe de Deus hospital university in Canoas/RS. The data collection occurred from September 2010 to August 2011, through a record (Figure 1) just designed to characterize the study. The record contained the newborn identification, the type and time of delivery, gestational age, the lifetime hour in which the test was performed, the use of handling facilitation and the EOATs record.

The equipment used in this research was the Otoport Lite, Otodynamics brand.

For the initial test, it was introduced an olive connected to a probe in the external auditory canal, which verified the stimulus stability, that should be less than 70. The transient evoked otoacustic emission (TEOAE) were tested for the frequencies 1000 Hz, 1.500 Hz, 2.000 Hz, 3000 Hz and 4000 Hz. In order to consider the infant newborns pass for the test, it was necessary a signal/noise greater than 6 dB in three frequency, including 4.000 Hz.

It was adopted as criteria inclusion, infant newborns of both gender, with gestational age among 37ª and 41ª weeks, who were doing the first screening. Three hundred fifty five newborns were excluded due to the presence of risk factors that are associated to hearing loss, according to Comusa and JCIH [7-11,] or even because of incomplete data in the newborn record.

If the newborn failed in one of the ears, the headset facilitation (MAF) was performed. So the probe was reinserted and a new test was conducted. The babies who continued failure after MAF application were sent to retest within 15 days. The newborns were subjected to testing without inspection of the external ear canal (EEC)

To prevent evasion in the retest, the mother received a guideline about the importance of the test, receiving prior appointment, at hospital discharge.

The data obtained were stored in a Excel database. Statistical analyses estimated the failure index of infant newborns without risk to hearing loss in the UNHS and verified the association with the variables gender, type of delivery and life time, through the K- square and the t- student, being considered statically significant the findings with $p \leq 0,05$.

Record Nº: _____

Newborn Identification
Mother' name:
Child's date:
BD: ___/___/___ Birth time:_____ Screening time: _____ DT:___/___/___ IG:_____
Gender: (1) M (2) F ( )
( )
Type of delivery: (1) vaginal (2) Cesarea ( )
EOAT result: (1) Pass (2) Fail (3) RE Fail (4) Fail LE
( )
Facilitation maneuver : (1) Yes (2) No ( )
Risk factor: (1) Yes (2) No ( )
Which is the risk factor?

Legend: H – hour, DT – day of test; GA – gestational age, M – male, F – female; TEOAE Result – Result of Transient otoacoustic emissions; Failure BE – failed in both ears; Failure RI – failure in the right ear; failure OE – failure in the left ear

Figure 1 – Data collection

RESULTS

The study sample consisted of 1,171 newborn records, being 615 (52.5%) infant male and 556 (46.5%) infant female, with gestational age (GA) between the 37th and 41st weeks, making an average of 39, 1, with a standard deviation of 1.0

Regarding the result of otoacoustic emissions evoked by stimulation transient (TEOAE), 1,034 (88.3%) passed, 137 (11.7%) failed in the first test, being 109 (9.3%) in both ears, 12 (1 , 0%) only in the right ear (RE), and 16 (1.4%) only in the left ear (LE).

Table 1 shows the results of TEOAE in relation to gender, and there was not found significant association (p = 0.0551).

Table 1 – EOAT results regarding gender variable*

		EOAT result				Total
		Pass	Fail both ears	Right ear	Left ear	
Gender	Male	536	64	7	8	615
		87,2%	10,4%	1,1%	1,3%	100,0%
	Female	498	45	5	8	556
		89,6%	8,1%	9%	1,4%	100,0%
Total		1035	109	12	16	1171
		88,3%	9,3%	1,0%	1,4%	100,0%

Source: Compiled by author

* Chi-square test (p = 0.551)

Legend: TEOAE – Transient otoacoustic emissions; BE Failure – failed in both ears; Failure RI – failed right ear; failure LE – failure in the left ear

Concerning the delivery, 826 (70.6%) had vaginal delivery and 345 (29.4%) cesarean delivery, in which 88% of the infant newborns with vaginal delivery passed the test, and 81 (9.8%) failed in both ears, eight (1.0%) failed to the right ear, and 10 (1.2%) failed in the left ear. In the cesarean delivery, 89.9% passed, 28 (8.1%) failed in both ears, four (1.2%) failed in the right ear and six (1.7%), in the left ear. From the results of the k-square test, it was found that there was no significant association between the type of delivery and the TEOAE results (p = 0.717)

In Table 2, it can be observed that the average lifetime of newborns that passed the screening was significantly higher in the first screening.

Regarding the lifetime variable of the UNHS first test, newborns up to 28 hours of life fail more often compared to those over 32 hours (Table 3).

Table 2 – EOAT results regarding to lifetime mean average variable for the first screening*

EOAT result	n.	Mean	Deviation	P
Pass	1.034	37,47	12,48	0,006
Fail	137	34,31	12,47	

Source: compiled by the author.
Student'st-test
Legend: TEOAE – Transient otoacoustic emissions

Table 3 – EOAT results in relation to lifetime variable for the first screening

Lifetime during the screening	EOAT result				Total	
	Pass		Fail			
	n.	%	n.	%	n.	%
Up to 16	6	0,6	3	2,2	9	0,8
17 to 20	14	1,4	5	3,6	19	1,6
21 to 24	63	6,1	16	11,7	79	6,7
25 to 28	160	15,5	31	22,6	191	16,3
29 to 32	166	16,1	16	11,7	182	15,5
over 32	625	60,4	66	48,2	691	59,0
Total	1.034	100,0	137	100,0	1.171	100,0

Source: compiled by the author.
* Chi-square test (p = 0.001)
Legend: TEOAE – Transient otoacoustic emissions;

DISCUSSION

There are several factors that can affect the results of TANU, and among them there are early hospital discharge, the one that occurs within the first 48 hours after delivery [12,13]. The Ministry of Health recommends that the discharges should not be given before 48 hours, considering the high educational value of this first hours tor the mother and because this is an important period in the detection of neonatal pathologies [14]. The university hospital discharge routine (UH) in which the hearing screening program is inserted is of 24 hours for vaginal delivery and 48 hours for cesarean delivery, and the average lifetime for hospital discharge was of 36.9 hours. Comparing with another study conducted in Rio de Janeiro / RJ, the average time of admission until hospital discharge was of 42.27 hours, being 93.42% of the infant newborns delivered from cesarean section[15]. In a study conducted in Campinas / SP, the average reached 187.2 hours[16]. It is noteworthy that 70.6% of the population of the present study had vaginal delivery, which according to the hospital has smaller hospitalization time, which explain the average hospitalization time found in this study. The population falls the recommendation of the Ministry of health[14], ie, 74% of births should be by vaginal delivery, which is considered safer to the mother and to the baby,

moreover, the time of hospitalization is below the recommended.

In the present study, it was observed that 88.3% of the infant newborns passed in the first screening with a mean average of 37.3 of lifetime. These data are similar to the research conducted in a public hospital located in Campinas / SP, in which 62.25% of the infant newborns were evaluated with two days of life, resulting in an index of 87.1% of 'passes' in the first screening[16]. Another study conducted in three private hospitals in Rio de Janeiro / RJ indicates that more than a half of the infant newborns (66.12%) underwent first screening before 24 hours of life, resulting in 24.41% failure of infant newborns in the first UNHS screening[15]. This index is justified, probably because they have carried out the first screening before 28 hours. When analyzing the population of the present study, it is concluded that the shorter the lifetime is, the higher the failure rate is, since newborns with life time up to 28 hours more frequently failed in the first screening, while those with more than 32 hours passed with greater frequency, which was statistically significant. It is highlighted that the average lifetime, when the first screening was performed, was significantly higher than that newborns who passed the first screening.

In the analysis of gender regarding the screening results, there was no significant difference, but it is clear that infant male had a higher failure rate than infant female: 64 (10.4%) of infant male failed in both ears compared to only 45 (8.1%) of infant female. These data are similar to the study conducted in a private hospital in the city of Maceió / AL, when it was found that 40 (2.5%) of infant male failed in both ears, while 16 (1.0%) of infant female had failed in both ears[17]. A study conducted in Rio de Janeiro / RJ found significance in their findings, since it states that the fail chance of the male infants is 1.5 times greater than the chance of female infants. This is explained by the literature, which shows that female infants exhibit frequency bands with higher amplitude of EOATs [18-21].

In the present study, bilateral failures were predominant in relation to unilateral failures, totaling 9.3%. These results agrees with studies conducted in Rio de Janeiro / RJ and Maceió/AL[15,17]. In the analysis of unilateral failures related to gender, no statistical significance was observed, confirming the study in Maceió / AL and Marília/SP[17-22]. On the other hand, a study conducted in Rio de Janeiro / RJ showed statistical significance, pointing out that, in the right ear, the chance of male infant failing is twice higher when compared to female infant ; already in the left ear, the chance of failing of a male infant is 1.5 times greater than the chance of a female infant. In the same study, the failures had unilateral predominance in the left ear because it shows 82.93% of fail [15]. The largest number of left ear failing in such research can be justified by the literature because of the low amplitude of the otoacoustic emissions compared with the right ear [17-19,21]. It is important to note that this discrepancy between the findings can be explained by the low rate of unilateral changes, found in this study, which represent only 2.4% of the sample, and only 9.1% of the newborns who were submitted to the first screening before 24 hours of lifetime, which may explain the low rate of change.

When analyzing the relationship between the type of delivery and the TANU results, no significant association was found. A study conducted in Bauru / SP, where the routine discharge is similar to the present study also found no significant difference, as well as the research conducted in Rio de Janeiro/ RJ[15-23].

Regarding the lifetime at the first screening, it is observed that newborns that passed at the first screening had significantly higher lifetime when compared to the infant newborns who had failed, which agrees with a study conducted in Rio de Janeiro/RJ[15]. The infant newborns who passed in UNHS had, on average, five hours more of lifetime than those who failed[15]. Also regarding the lifetime and the result of TEOAE observed in the present study, the infant newborns with up to 28 hours of lifetime more often failed in the first screening than those with more than 32 hours. Otherwise, a study conducted in Bauru / SP did not find a significant association with respect to lifetime, or what is the most appropriate time – considering 24 to 54 hours – to conduct the first screening, suggesting only that it not can be done before 24 hours of lifetime. This divergence can be explained by the age group and the small study population, which consisted of 262 newborns[23].

CONCLUSION

The present study showed a satisfactory level of passes in the first newborn hearing screening, totaling 88,3% of the sample. The rate of pass / fail did not vary with the gender or the type of delivery. There was a higher rate of passes in newborns screened with over 32 hours of life. For this reason, it is suggested that the first screening should be done after 32 hours of lifetime

RESUMO

Objetivo: verificar em recém-nascidos (RNs) sem risco de perda auditiva o índice de passa/falha na Triagem Auditiva Neonatal Universal (TANU), relacionando-o com o sexo, o tipo de parto e o tempo de vida. **Método**: caracteriza-se como um estudo quantitativo, retrospectivo, transversal e de grupo, inserido na atenção secundária à saúde do hospital universitário onde foram analisados 1.526 prontuários de RNs, com analisador de Emissões Otoacústicas Transientes (EOAT) modelo *Otoport Lite*. Adotou-se como critério de inclusão RNs de ambos os sexos, nascidos a termo. Foram excluídos da pesquisa 355 RNs que apresentaram um dos indicadores de risco associados à perda auditiva, ou ainda se alguns dos dados coletados pela pesquisa estivessem incompletos. A amostra estudada foi de 1.171 prontuários. **Resultados:** 88,3% dos RNs passaram na primeira triagem. Não foram encontrados achados significantes em relação ao índice de falha e aos fatores sexo e tipo de parto. Os RNs que realizaram a triagem até 28 horas após o nascimento falharam mais frequentemente, enquanto os com mais de 32 horas de vida passaram mais frequentemente na primeira triagem. **Conclusão:** o estudo demonstrou que houve um momento mais adequado para a realização da primeira triagem após 32 horas de vida.

DESCRITORES: Audiologia; Triagem Neonatal; Recém-Nascido

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