



The performance of distortion product otoacoustic emissions and automated auditory brainstem response in the same ear of the babies in neonatal unit

Siti Noor Hidayah Abdul Wahid^a, Mohd Khairi Md Daud^{b,*}, Dinsuhaimi Sidek^b,
Normastura Abd Rahman^c, Suzana Mansor^d, Mohamad Normani Zakaria^a

^a School of Health Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

^b Department of Otorhinolaryngology Head and Neck Surgery, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

^c School of Dental Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

^d Audiology Clinic, Hospital Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

ARTICLE INFO

Article history:

Received 22 March 2012

Received in revised form 12 June 2012

Accepted 15 June 2012

Available online 6 July 2012

Keywords:

Hearing tests

Neonatal screening

Auditory neuropathy

ABSTRACT

Objective: To identify the outcomes of hearing screening using different protocols of both Distortion Product Otoacoustic Emissions (DPOAE) and Automated Auditory Brainstem Response (AABR) tests in the same ear of the babies in a neonatal unit population.

Methods: A cross-sectional study was carried out on babies who were admitted into a neonatal unit. By using a formula of single proportion and considering 20% drop out, the number of sample required was 114. The subjects were chosen by using a systematic random sampling. The infants selected were subjected to DPOAE followed by AABR tests screening at the same setting before discharge.

Results: There were 73 newborns (61.6% male and 38.4% female) participated in this study with a total of 146 ears screened. Ototoxic medication was the most common risk factor followed by hyperbilirubinaemia and low birth weight. AABR had higher passing rate (82.9%) as compared to DPOAE (77.4%). The highest passing rate was achieved if the protocol of either passed DPOAE or AABR was used (90.4%). The rate was lower when auditory neuropathy spectrum disorder (ANS) has been considered (82.9%). Hyperbilirubinaemia, prematurity, craniofacial malformation and ototoxic drugs seem to be the high risk factors for auditory neuropathy.

Conclusion: AABR has a higher passing rate as compared to DPOAE. However, the use of both instruments in the screening process especially in NICU will be useful to determine the infants with ANSD who may need different approach to management. Therefore, a protocol in which newborns are tested with AABR first and then followed by DPOAE on those who fail the AABR is recommended.

© 2012 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Hearing is necessary to learn language and speech. The abnormal functioning auditory system will affect the social, emotional and intellectual development of the children. Early detection and intervention will help minimising such effects. Therefore, newborn hearing screening programme has been advocated.

It is known that the prevalence of significant hearing loss appears to be one to three in a thousand child births [1–5]. Therefore it is considered as the most common congenital deficit in humans. This value could become one to five in 100 if only babies

in the neonatal intensive care unit (NICU) and infants selected from at-risk registers are considered [6–11].

Otoacoustic emissions (OAE) and automated auditory brainstem response (AABR) are the two types of screening technologies commonly used in newborn hearing screening programme. Both procedures are quick and painless and have been demonstrated practical and effective. Depending on the protocols used, either type can be used alone or in sequence. This study was aimed to identify the outcomes of hearing screening using different protocols of both DPOAE and AABR in a neonatal unit population which caters for the graduates of Neonatal Intensive Care Unit (NICU) and the infants who are unwell that need admission to the ward.

2. Methodology

A cross-sectional study was carried out on the children who were admitted into a neonatal unit, Hospital Universiti Sains

* Corresponding author. Tel.: +60 9 7676413; fax: +60 9 7664093; mobile: +61 2 9286091.

E-mail address: khairi@kck.usm.my (M.K. Md Daud).

Malaysia. The neonatal unit receives almost all the NICU graduates who are stable enough while waiting to be discharged. The unit also receives the problematic infants who do not need NICU treatment such as mild to moderate neonatal jaundice.

The sample size was calculated using single proportion formula based on the prevalence of babies who were at risk for hearing loss at 44% [12]. The calculation indicated that minimum sample size of 95 subjects would be sufficient to obtain the 0.1 precision in calculating the prevalence of babies who were at risk for hearing loss with 95% confidence interval (CI). With anticipation of 20% non-response rate, it was decided to take 114 subjects.

All infants in the neonatal unit were included in this study. They were chosen by using a systematic random sampling. The conditions of the ears were assessed by using an otoscope. The infants with impacted ear wax, middle ear effusion and persistent mesenchyme or amniotic fluid in the external ear were excluded from the study. The infants selected were subjected to DPOAE (Eclipse OAE, Interacoustic, German) with the frequencies used at 2, 3, 4 and 5 kHz followed by AABR (ABRis, Interacoustic, Germany) screening tests at the same setting as near to discharge as possible. The tests were done in their bassinets in the neonatal unit itself. No sedation was given and whenever possible neonates were tested in sleeping/quiet state, after feeding and/or bathing. Both instruments produced a “pass” or “refer” result and did not require any special skills for the interpretation of the results. The tests were repeated two times in cases with “refer” result. Data were entered and analysed using SPSS version 12.0. Descriptive statistics such as frequency and percentages were calculated for all the categorical variables.

Ethical approval was obtained from Research Ethics Committee (Human), Universiti Sains Malaysia (Ref.: USMKK/PPP/JEPeM (219.3.(14.1)).

3. Results

There were 73 newborns (61.6% male and 38.4% female) participated in this study with a total of 146 ears screened. The majority of the participants were Malays (98.6%) and only 1 (1.4%) was Chinese. This reflects the actual racial composition of the population.

Table 1 shows the risk factors for the infants involved in this study. Ototoxic medication was the most common risk factor followed by hyperbilirubinaemia and low birth weight.

Fig. 1 shows the number of risk factors per child. Nearly half of the babies in the neonatal unit did not have any risk factors for hearing impairment. Forty one percent of the infants had at least one risk factor, 12 percent had two risk factors while about 1 percent had three, four and five risk factors.

Table 2 shows the outcomes of hearing screening by ears according to different protocols used. AABR had a higher passing rate (82.9%) as compared to DPOAE (77.4%). The highest passing rate was achieved if the protocol of either passed DPOAE or AABR

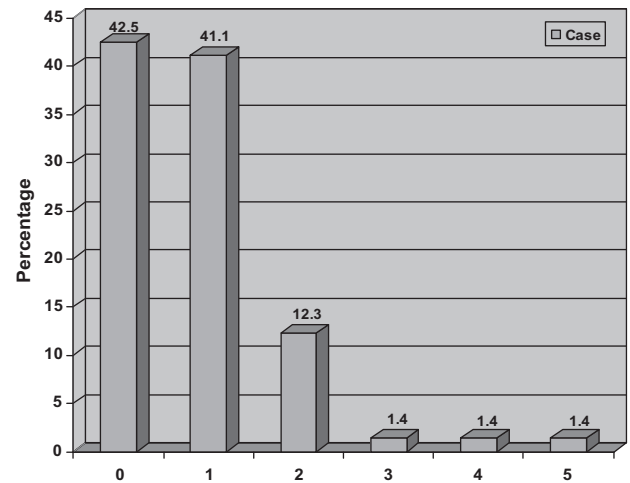


Fig. 1. The percentage of risk factors found per child.

was used (90.4%). The rate was lower when auditory neuropathy spectrum disorder (ANSD) has been considered (82.9%).

Table 3 shows the high risk factors in the patients with the possibility of having ANSD. Except in one case (case no. 2), hyperbilirubinaemia, prematurity, craniofacial malformation and ototoxic drugs seem to be the high risk factors for auditory neuropathy.

4. Discussion

Universal newborn hearing screening is becoming a standard programme in many centres nowadays. Early identification of hearing loss with early medical and educational interventions has been demonstrated to significantly improve communication skills and cognitive ability. Most of the centres are using AABR and OAE for the screening as they are sensitive and specific to the identification of hearing losses but with no standard protocols.

In this study, the prevalence of passing rate using DPOAE test was 77.4 percent. The passing rates for the first screening using OAEs vary depending on the different centres and group of the neonates studied. They were ranging from 66.7% to 93.5% [13–19]. In NICU babies, the different aetiologies have different referral rates [20]. Their failure rate was usually higher than the well babies' resident [21]. The presence of OAEs provides direct evidence of the existence of an active mechanism in the cochlea. However, OAEs will be absent if there is a significant external and/or middle ear problems. Besides that, DPOAE test must be done in environment where it is quiet, infants are in calm condition and the probe tip is snugly fitted in order to get the reliable results. In the present study, the passing rate can be considered low as compared

Table 1

Risk factors for hearing loss.

Risk factor	n (%)
Significant family history	1 (1.4)
In utero infection	1 (1.4)
Craniofacial anomalies	1 (1.4)
Birth weight < 1500 g	4 (5.5)
Hyperbilirubinaemia	7 (9.6)
Ototoxic medication	37 (50.7)
Bacterial meningitis	1 (1.4)
Low Apgar score (0–4 at 1 min, 0–6 at 5 min)	2 (2.7)
Mechanical ventilation lasting 5 days or more	1 (1.4)
Congenital anomalies (with risk of deafness)	3 (4.1)

Table 2

The outcomes of hearing screening on each ear according to different protocols.

Protocol	n	%
Passed DPOAE	113	77.4
Passed AABR	121	82.9
Either passed DPOAE or passed AABR	132	90.4
Either passed DPOAE or passed AABR excluding passed DPOAE with failed AABR (auditory neuropathy)	121	82.9
Passed both DPOAE and AABR	102	69.9

Download English Version:

<https://daneshyari.com/en/article/4112499>

Download Persian Version:

<https://daneshyari.com/article/4112499>

[Daneshyari.com](https://daneshyari.com)