

Otoacoustic Emission (OAE) as a Hearing Screening for Early Detection in Newborn Baby

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Abstract: A hearing is a necessity for communication between humans. Hearing loss that occurs at preschool age can affect the development of speech, social, and emotional and may severely impact their academic achievement in the long run. In the present days, objective hearing can be examined as early as possible using a relatively safe and easy-to-use tool, and one of them is otoacoustic emission (OAE). It is a descriptive study with a cross-sectional design. The research aims to determine hearing disorder in the newborns using OAE. This research was conducted in Sundari Hospital and Muhammadiyah Hospital in Medan, North Sumatera. Forty-eight newborn were included in this study. The result indicated that 41.6% of newborns showed bilateral refer, and 41.67% had a risk factor. The signifies the importance of early hearing screening using OAE in newborns, even though refers is not an absolute indication of hearing loss, but it was necessary to do follow-ups and further examinations to them. In conclusion, OAE may be used as a standard tool to detect the hearing disorder in newborn as early as possible.

1 INTRODUCTION

Hearing loss was often neglected due to parents ignorance regarding the possibility of the child having a disorder. It was not unheard of that these children may be considered as autistic or hyperactive due to their unruly behavior resulted from the hearing problem. Therefore early diagnosis of hearing loss is essential. Hearing loss detection in infants is not easy, and it was commonly found after the age of two or three. In Italy, 98.2% of 3238 newborns were “pass.” In Cipto Mangunkusumo Hospital Department of Community ENT (1992 - 2006), there were 3087 children found with severe bilateral neuronal deafness, most of them were one to three years old (43.70%), and 6,41% were under one year old (Suwento, 2007).

Suleh & Djelantik (1999) in Dr. Hasan Sadikin Hospital Bandung reported the findings of three “bilateral refer” case from 212 of newborns. Since 1993, The National Institute of Health in America recommended all newborns to undergo hearing examination. Preferably before they leave the hospital, the comprehensive hearing function

evaluation is advisable if a child presented as “refer” before the age of six months (Suardana W, 2008).

Newborn Hearing Screening (NHS) performed in two groups of individual, universal newborn (all infants) and targeted newborn (high-risk). Even though screening should be performed as a gold standard for hearing screening in newborns (Suardana, 2008; Suwento, 2007), in order to modern tools to investigate hearing loss, objective screening can be done as early as possible using a relatively safe and easy-to-use tool, one of them is an otoacoustic emission (OAE), which is currently a standard gold instrument. The purpose of the examination as early as possible is to habituate hearing aids as soon as possible to obtain better improvements in language development and the child's vocabulary (Zizlavsky, 2008).

An AOE is the first option to detect newborns hearing disorder to relatively safe, non-invasive, secure, low-cost and objective. (Lee K. J. & Peck J. E, 2003; Suleh S. & Djelantik, 1999). The objective of this research was to examine hearing by OAE as an early screening of newborn in two hospitals in Medan, North Sumatera.

2 METHOD

This research was a descriptive observational study, using a cross-sectional design. The research was conducted at the Sundari Hospital and Muhammadiyah Hospital and involved 48 (forty-eight) newborns. The samples of this study are all newborns born within January to September 2011, and fulfilled the following inclusion criteria:

- Age is ranging from 24 hours to seven days old.
- Unobstructed ear canals.
- No infection in both ears

The variables evaluated in the examination are the result which is “pass” or “refer,” risk factors, gender, and delivery process.

ENT examination was mandatory for all the samples. The sample was examined by Oto Read tool TEOAE, Interacoustics Denmark. All newborns under seven days old underwent ears, nose and oropharynx examinations using endoscope.

Children with anatomical abnormalities were excluded from OAE examination, and every newborn who had normal anatomy was next evaluated for OAE. The interpretation of OAE is either “pass” or “refer.”

The data was presented in four tables to show the number of newborns with “pass” or “refer” results, risk factors, delivery type, and gender.

3 RESULTS

The result conducted in 48 of newborns, whereas qualification of inclusion criteria. Table 1. Indicate 20 of newborns (41.66%) showed bilateral refer. In contrast to other centers as reported by Suardana & Wiranadha (2007) at Sanglah Hospital Denpasar, obtained refer in 18.41% samples from 831 of newborns in period May 2006 - May 2007. Wijana (2008) at Melinda Hospital Bandung reported that the pass results were obtained in 613 infants (88.84%) and referrals in 77 infants (11.16%) on the first examination. After one month the examination repeated and only 31 infants were controlled (40.26%), 46 infants drop out for the second examination (59.74%), the results are two bilateral refer and 29 bilateral passes. In another study reported by Khairi et al. (2005), at Universiti Sains Hospital Malaysia, were found 5 of infants (1.28%) with referral results from 392 of subjects.

Table 1: Distribution of OAE results

OAE Result	Amount	Percentage
Bilateral Pass	12	25
Bilateral Refer	20	41.66
Unilateral	16	33.33
Pass/Refer		
Total	48	100

There is almost no difference amount among male and female; it is shown in Table 2, the distribution of gender newborns. It is relevant to Khairi et al. (2005) in Malaysia, found 45.4% is female, and 54.4% is male. Meanwhile, Mashari (1997) in Yogyakarta obtained 51.07% of male and 48.93% of female.

Table 2: Distribution of gender newborns

Gender	Amount	Percentage
Male	26	54.17
Female	22	45.83
Total	28	100

The American Academy of Pediatrics Joint Committee on Hearing (1995) investigate no-risk factor newborn has bilateral deafness as many as 1 to 3 newborn per 1000 birth, and found as many as 2 to 4 newborns in intensive care unit. It showed 41.66% bilateral refer, whereas 58.33% of the risk factor.

Table 3. Showed 41.67% of newborns have a risk factor, in the literature describe many risk factors such as low birth weight (LBW), antenatal infection, genetic, anatomy abnormalities, and ototoxicity drugs consumption. Some literature described the higher risk of hearing disorder is low birth weight; it provoked asphyxia or acidosis induce metabolic dysfunction; it correlated to affect the auditory system (Reardon W,1997).

The hearing screening in newborns both risk or no risk factor should be evaluated, in Israel, the NHSP (Newborn Hearing Screening Program) coverage 98.7% approximately 179.000 live births per year for 2014- 2016 and average referral rates were under 3% (Wasser J et al., 2019). Despite AABR (Automated Auditory Brainstem Response) more effective than OAE to screened hearing disorder, but AOE easier to use than AABR. Ngui et al. (2019) in Malaysia reported the pass rate in AABR (67.9%) was higher than DPOAE (Distortion Product Otoacoustic Emission) (50.1%) from 722 non-risk factors (1444 ears).

Table 3: Distribution of Risk Factor

Risk Factor	Amount	Percentage
Yes	20	41.67
No	28	58.33
Total	48	100

The type of delivery majority found in Sectio Caesarea (SC) is 58.33% of total samples; it is seen in the table. 4. Since spinal or epidural anesthesia used to Sectio Caesarea, it is safer than vacuum extraction. The vacuum extraction correlates asphyxia of the newborn due to birth prolonged time.

Table 4: Distribution of Delivery type

Type of Delivery	Amount	Percentage
Spontaneous Labor (SL)	18	37.50
Section Caesaria (SC)	28	58.33
SL + Extraction	2	4.17
Vacum		
Total	48	100

4 CONCLUSIONS

The research was conducted in 48 of newborns to determine hearing disorder by using OAE, OAE is the easy-to-use tool to examined hearing as early as possible in newborns. Bilateral refers in OAE is not absolute value to conclude hearing loss, a re-evaluation should be performed after 3 and six months using Brain Stem Evoked Auditory (BERA) as a preventive effort of hearing loss as early as possible.

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