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Review article

National Newborn Hearing Screening Program in Turkey: Struggles and implementations between 2004 and 2008

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ABSTRACT

Objective: In this review, we have presented the data of our National Newborn Hearing Screening Program (NNHSP) with total 764,352 newborns those screened in last five years.
Methods: National Newborn Hearing Screening Program (NNHSP) has been conducted in Turkey since the year 2003. National Newborn Hearing Screening Program (NNHSP) had begun at the end of 2003 only in 1 center. After birth, in the third day, Transient Evoked Otoacoustic Emissions (TEOAEs) test criteria and if necessary, auditory brain response (ABR) testing evaluation methods were applied to newborn. The children diagnosed with hearing loss were further referred for advanced treatment and rehabilitation to advanced audiologic centers.
Results: After five years of carrying out the program (between 2004 and 2008) a total number of 764,352 newborns were screened for hearing impairment. In the year 2008, National Newborn Hearing Screening Program (NNHSP) had given the chance for 2136 children with various types of hearing loss (320 with unilateral and 417 with bilateral hearing loss) to detect and refer to more experienced centers for further treatment.
Conclusions: Our results indicate that the necessity of newborn hearing screening is an indispensable issue. We have been targeted to develop National Newborn Hearing Screening Program (NNHSP) till given chance to access for every newborn in Turkey in next five years.

Contents

1. Introduction

The incidence of congenital deafness as a major birth defect, is accepted as 1.64 per 1000 live births (bilateral hearing loss: 1.00 per 1000 live births and unilateral hearing loss: 0.64 per 1000 live births) which corresponds to about 1000 new cases per year and about 5 in 1000 with lesser degrees of hearing loss [1]. The recommended standard is to be able to detect the hearing loss in newborns in the first 3 months and intervention implemented in the first 6 months of life. Otherwise, delayed detection and intervention will absolutely affect speech, language and psychosocial development, resulting a failure his/her school-life. National Newborn Hearing Screening Program (NNHSP) is the main valid way of detecting all babies born with hearing loss, within recommended time period. In Turkey, NNHSP has been implemented in 76 of total 81 provinces in the year 2008. NNHSP has begun firstly in the year 2003 in Turkey and because of the mass communication lack about the importance of hearing screening

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Table 1
Summary of the results of the Turkish National Newborn Hearing Screening Program between 2004 and 2008.

	2004, *n* (%)	2005, *n* (%)	2006, *n* (%)	2007, *n* (%)	2008, *n* (%)	2004–2008, *n* (%)
Children delivered	1,378,011 (100)	835,699 (100)	891,240 (100)	1,337,123 (100)	1,327,109 (100)	5,769,188 (100)
Children not covered	1,365,346 (99.9)	739,386 (88.4)	763,144 (85.6)	1,147,535 (85.8)	989,419 (74.5)	5,004,830 (86.7)
Screened	12,665 (0.01)	96,313 (11.6)	128,096 (14.4)	189,588 (14.2)	337,690 (25.5)	764,352 (13.3)
Suspected	85 (0,06)	1,378 (0,01)	674 (0.005)	2,732 (0.01)	3,158 (0.009)	8,027 (0.01)
Diagnosed	11 (0.12)	76 (0.05)	145 (0.21)	400 (0.16)	738 (0.23)	1,370 (0.17)

parents' awareness and number of early detection is still low. If health personnel especially the ones who contact neonates in delivery room and obstetrics services follows up the babies and warns the parents about the importance of screening, the number of screened neonates will increase highly. Additionally, the long-time management of hearing screening program by an experienced team, the powerful analysis of data and the more usage of informative technologies in this area will bring higher success rates in NNHSP. We can keep the children away from the distressing results of hearing loss and deafness by early detection and effective intervention.

2. Materials and methods

There are three main screening levels at the NNHSP in Turkey. The first level is the screening of the newborns after birth when they are 3 days old. In this level, there are 176 registered centers and the newborns are screened at least two times by Transient Evoked Otoacoustic Emission (TEOAE) test. If newborns do not meet the TEOAE pass criteria they undergo for two times auditory brainstem response (ABR) test in a week. All data which obtained in this level are registered in the central database of our Ministry of Health and referred to the second level for ENT examination and testing. The second level of the program consists of 72 ENT-Otolaryngology departments which analyze and verify the positive TEOAE tests of first level. There are 11 ENT-otolaryngology departments in the third level. These centers also research risk factors and the hearing behaviors of the children in latest 15 days. The data which obtained in the second level are also registered in central database of the Ministry of Health. The last level of the program is composed by advanced audiological centers. These centers provide the final treatment and rehabilitation facilities for hearing loss or deaf children. All data are transferred to the central database of the Ministry of Health.

3. Results

NNHS covered 764,352 children between 2004 and 2008. This number equals for 13% of children delivered in Turkey. The number of children screened annually was increased prominently during this period, ranging between 12,665 and 337,690 newborns in 2004 and 2008, respectively. The total number of children that did not pass the test criteria was 0.17% ranging between 0.05% and 0.23% in 2004 and 2008, respectively. Only 0.01% of children who registered in our database with positive results were referred to the second level between 2004 and 2008. These percents ranged and were 0.06%, 0.01%, 0.05%, 0.01% in 2004, 2005, 2006, 2007, 2008, respectively. However, 1370 children with various types of hearing loss and deafness were identified and rehabilitated by this program (Table 1).

4. Discussion

Especially in the last decade, the number of children who delivered in hospitals increased evidently in Turkey. The developments in digital technologies have also triggered the improvements in mass communication systems and in informative programs on media. The health database systems have been especially set up for newborn screening in addition to newborn hearing screening (phenylketonuria, hypothyroiditis and biotinidase deficiency) in Turkey. These developments also result in a great number of data which have to be processed, documented and analyzed. Turkish NNHSP had screened 96.3% of all babies delivered, between 2004 and 2008 that total number of children covered by the program is 764,352. This program may be accepted as a successfully developing program in comparison to the most of other hearing screening programs [2–5]. Although these tests analyze different hearing mechanisms, both TEOAE and the auditory brainstem response (ABR) tests are quickly applicable, non-invasive, easy to perform for newborns [6]. TEOAE test instrument uses transient sound waves (called emissions) produced by the motion of the outer hair cells in the cochlea. This test defines the peripheral hearing loss. If an infant is not able to hear, no emissions will be detected during the test. This TEOAE technology has a sensitivity of 95% and a specificity of 90% [7]. It is apparently revealed that the total number of newborns delivered in Turkey is very higher that screened by our program when we compare to the total number of last five years (Fig. 1).

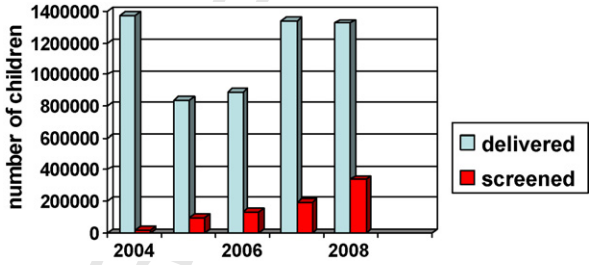

Fig. 1. The number of children delivered and covered by the National Newborn Hearing Screening Program in Turkey between 2004 and 2008.

5. Conclusion

Although the struggles of administrators and health personnel who work in Newborn Hearing Screening Program gradually increase in years, our results indicate that the implementations of Newborn Hearing Screening Program in Turkey are not adequate yet. We have to improve the National Newborn Hearing Screening Program in Turkey especially to increase the number of children covered immediately. We should also struggle to access the universal main goal for Newborn Hearing Screening Programs as soon as possible [8,9].

6. Key points

1. This report contains the first national data about the Turkish Newborn Hearing Screening Program.

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2. We are able to define where we are in newborn hearing screening now and where we will be in the future.
3. The experiences in the report may help to workers of other Newborn Hearing Screening Programs those will begin to screen newborns in the near future

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