Oral Communication Development in Severe to Profound Hearing Impaired Children After Receiving Aural Habilitation

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Abstract- Communication, cognition, language, and speech are interrelated and develop together. It should come as no surprise to us that the key to intervention with deaf children is to establish, as early as possible, a functional communication system for the child and the parents. Early intervention programs need to be multidisciplinary, technologically sound and most important, it should take cognizance of the specific context (community, country) in which the child and family function. The main aim of this study was to obtain oral communication development regarding current status of the intervention (aural habilitation and speech therapy)for children with severe to profound hearing impairment in Iran. A prospective longitudinal study was undertaken on a consecutive group of children with severe to profound deafness. Nine severe to profound hearing-impaired children out of the primer 42 cases, who were detected below two years old, had been selected in the previous study to receive aural habilitation. The average of their speech intelligibility scores was near 70% at age 6, which was accounted as poor oral communication and only two of them were able to communicate by spoken language. An integrated intervention services continued again for one year and their oral communication skill was assessed by their speech intelligibility. The intelligibility test of children was recorded on audio-tape, when they read 10 questions such as where is your home. This can be answered only in one word. Each tape was presented to10 normal hearing listeners, and their task was to write down, the answers in Persian orthography. At the beginning (at age 6) the average speech intelligibility score of these children was 72% and only two of them had score of 90% and 100%. At age 7, all of the severe groups were over 90%, and only two profound ones achieved the score of 48% and 62%. All of severe groups develop *oral communication,* but profound ones had a semi-intelligible speech and used *Total communication.* Oral communication development in severe to profound hearing impaired children is achievable in Iran, but needs integrated public services on aural habilitation and speech therapy. By providing such services, a considerable number of hearing impaired children would have a favorable chance to take part in regular schools and benefit from equivalent social development with normal hearing peers.

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Key words: Speech intelligibility, development, hearing impaired children, oral communication

Introduction

Communication, cognition, language , and speech are interrelated and develop together. As children get older, they practice producing speech sounds, and they think about their environment in more complex ways. Their desire to communicate and their capacity for thinking complex thoughts motivate them to produce increasingly more complex language.

At the same time, they are gaining more control over muscles that are used to produce speech, leading to an ability to put different kinds of sounds and syllables together to produce words. Their continuing speech development makes them more intelligible, so people understand what they are trying to say and are more responsive to their needs.

It is generally accepted that more than 90% of deaf children are born to parents who have normal hearing (1). It should come as no surprise to us that the key to intervention with deaf children is to establish, as early as possible,a functional communication system for the child and the parents.Meeting the needs of parents

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around the time of diagnosis of disability among their children and emotional supports of them by community link team,play an important role in intervention for their children (2). It has been indicated that in low sicio-economic level, communication methods were generally inappropriate with 41.3% of the mothers and 48.5% of the fathers (3).

So,early intervention programmes not only need to be multidisciplinary,and technologically sound but also should take cognizance of the specific contex (community,country) in which the child and family function (4) .

The degree of oral Communication skills of the hearing impaired children can be tested by means of speech intelligibility (5) oral language acquisition is highly dependent upon what the deaf child can hear. Hence, appropriate amplification and cochlear implants, provide deaf children with a means of accessing the auditory information that are essential for language development (6-7). It has been emphasized that speech intelligibility is one of the important feature of spoken language development in severe to profound hearing-impaired child. Intelligibility refers here to “the degree to which the speaker’s intended message is recovered by the listener” (8) or “the comprehensibility of the specifically linguistic information encoded by a speaker’s utterances” (9). Measuring speech intelligibility, however, is problematic because intelligibility metrics are affected by a number of factors, including articulation / phonological aspects, suprasegmental factors, contextual, and semantic / morphologic / syntactic feature (10-11).

Analysis of individual speakers' intelligibility data revealed that sentence intelligibility scores were higher than word intelligibility scores (12).

The main aim of this study was to obtain oral communication development regarding current status of the intervention (aural habilitation and speech therapy) for children with severe to profound hearing impairment in Iran.

Patients and Methods

A prospective longitudinal study was undertaken on a consecutive group of children with severe to profound deafness in continuing with the previous survey from (2001-2006)

Subjects

Nine severe to profound hearing-impaired children out of the primer 42 cases, who were detected below two years old had been selected in the previous study to receive aural habilitation.

Their mean average hearing threshold was (78.8 dB) in the better ear. The mean age at the beginning of auditory habilitation was 17 months.(age range 7-24 months). From July 2006 to October 2007 they got 7 years old. The average of their speech intelligibility scores was near 70% at age 6, which was accounted as poor oral communication and only two of them were able to communicate by spoken language. All children had normal intelligence and co-operative parents. Workshops for parents, therapists and educators were presented by department of Deaf Education Social Welfare Rehabilitation University (Tehran, Iran) on correcting speech production and introducing group playing including group singing with participation of normal hearing children. These songs were designed based on aural enhancement techniques to facilitate oral language learning. These children were also attended in regular preschool from 6 to 7 years old.

Test procedure

The procedure that can asses one of the aspect of oral communication skills such as speech intelligibility score was designed. The intelligibility test of children was recorded on audio-tape, when they read 10 questions such as where is your home. Which can be answered with one word only? Words of these 10 questions were compounded of fricatives (s-sh ...), back consonants (k-g-gh...), and ...other consonants which their production was very difficult for hearing impaired children such as (R -Z) .These questions were read by each child were presented via speakers at a comfortable level to normal hearing listeners. 90 students of Shahid Beheshty University in 9 groups answered to these questions. Each child's tape was given to 10 students, the other tape was presented to another 10 persons .The listeners had the possibility of repetition and their task was to write down, the answers in Persian orthography .The mean score of control group (peer normal hearing) at age 6 was determined 99.22% and because of their high score, we didn't test them again at age 7.

Results

At the beginning (at age 6) the average speech intelligibility score of these children was 72% and only two of them had score of 90% and 100% (Table 1).

At age 7, all of the severe groups were over 90%, and only two profound ones achieved the score of 48% and 62% (Table 1). Control group in the previous study achieved average of 99.22%at age 6, and we didn't score them again (Table 2).

Table 1. Descriptive Status of Studied Group

Case Number	Gender	Age	Hearing Loss	SI 6 years BIT	SI 7 years
Case 1	F	21	90	40%	48%
Case 2	M	18	90	50%	62%
Case 3	M	21	80	90%	98%
Case 4	F	7	70	70%	90%
Case 5	F	18	70	66%	92%
Case 6	M	20	80	100%	100%
Case 7	F	12	80	80%	92%
Case 8	M	24	70	68%	94%
Case 9	F	12	80	84%	90%

SI = Speech Intelligibility

Table 2. Descriptive Statistics for SI Score of the control Group

Age	Number	Min	Max	Mean	S D
Age 4	27	92	100	96.00	2.23
Age 5	27	94	100	97.85	1.93
Age 6	27	96	100	99.22	1.18

All in all, severe group develop *oral communication*, but profound ones had a semi-intelligible speech and used *Total communication.*

Discussion

Aural habilitation or the main intervention for hearing impaired children refers to verity of services and procedures that are designed to help a person cope with the difficulties presented by a hearing loss. Aural habilitation are used primarily with children who are hearing impaired from an early age .Because these children had no time to develop communication, the focus is to teach the missing skills in developing spoken language or oral communication.

Oral communication development is highly dependent upon the age of identification and intervention .In Colorado system, age of identification can be interpreted as almost synonymous with age of intervention (R13). In developing countries making the benefits of early intervention is an elusive luxury, out of reach for infants born in these areas (R14). Thus deaf children, who experience significant disruptions in auditory input, are likely to show delays not only in the production of oral language , but in other important aspects of development such as visual attention (15). In our study, we didn't have access to the hearing impaired children below 6 months, and we selected the cases with age up to 2 years old. As Borg showed the degree of delay is related to the severity of hearing loss. Above 60dB HL oral language delay is more pronounced, probably due to a loss of hearing acuity (16). The average of hearing loss in the studied group was 78.8 dB and showed about 2 to3 years delay in spoken language development. Robbin and his colleagues indicated that on the basis of their analysis, deaf children were predicted to make half or less of the language gains of their peers with normal hearing (17). In this survey case No 1 and 2 which were profound, showed half of the spoken language development in compare with others. Generally, normal hearing children during the period from 2-4 years of age move from expressing their ideas in simple telegraphic speech to being able to ask questions, use negation, talk about past and future events, and describe complicated situations (18). As mentioned before, our study was in continuing with our previous ones on this group, which showed that normal hearing peer group achieved adult like speech intelligibility around 4 years old while, the studied group showed 2-3 years delay in speech intelligibility development (19). Metz and Samar in 1985 tried to measure speech intelligibility of severe to profound hearing impaired speakers by segmental and prosodic speech characteristics and showed a considerable distance between their scores and normal hearing children (9) .Our study indicated the same result.

Waltzman and her colleagues in 2003 showed that children with cochlear implants developing oral fluency and the majority of them showed age appropriate receptive and expressive language (20).

On the other hand in developing countries special education services for hearing impaired children is very limited. For example there are only two special schools available for 3-5 years old children in Delhi (21). In Tehran, in the past two years only two inclusive schools established for hearing impaired children while ,we need more and more special education services based on oral communication teaching methods with proper assessment technique to evaluate speech and language level of each child. As special education need high financial resources, developing countries such as Singapore concentrated on early detection of childhood deafness, together with early and effective intervention to maximize the chances of successful integration into mainstream education and society (22).

In this survey we provide public services for 9 severe to profound hearing impaired children to enhance oral communication development, and 7 severe cases plus one profound could enroll in regular schools and one profound took part in inclusive schools .

Oral communication development has been investigated in this study as a preliminary pilot study and should be supported by other studies on different aspect of speech and language development. Our next provision is to utilize more pilot study in early intervention in Iran to seek our problems and probably suggested some solutions. We agree with Olusanya, that pilot studies are necessary in each country to provide empirical data that will guide health care provider who wish to introduce such a program at any level of healthcare delivery (23). We also hope that it be possible for us to fallow these 9 children in the next years and probe other aspect of their language development. In conclusion, oral communication development in severe to profound hearing impaired children is achievable in Iran, but needs integrated public services on aural habilitation and speech therapy. By providing such services, a considerable number of hearing impaired children would have a favorable chance to take part in regular schools and benefit from equivalent social development with normal hearing peers. In addition to this opportunity for a hearing impaired child and his or her family, financing an integrated public services at a nationwide level, will save other more investing for special school for deaf children in the future.

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References

1. Gillam RB, Marquardt TP, Martin FN. Communication Sciences and Disorders. San Diego, CA: Singular Publishing Group; 2000.
2. Rahi JS, Manaras I, Tuomainen H, Hundt GL. Meeting the needs of parents around the time of diagnosis of disability among their children: evaluation of a novel program for information, support, and liaison by key workers. Pediatrics 2004;114(4):e477-82.
3. Mukari SZ, Vandort S, Ahmad K, Saim L, Mohamed AS. Parents' awareness and knowledge of the special needs of their hearing-impaired child. Med J Malaysia 1999; 54(1): 87-95.
4. Gopal R, Hugo SR, Louw B. Identification and follow-up of children with hearing loss in Mauritius. Int J Pediatr Otorhinolaryngol 2001;57(2):99-113.
5. Metz DE, Samar VJ, Schiavetti N, Sitler RW, Whitehead RL. Acoustic dimensions of hearing-impaired speakers' intelligibility. J Speech Hear Res 1985;28(3):345-55.
6. Bollard PM, Chute PM, Popp A, Parisier SC. Specific language growth in young children using the CLARION cochlear implant. Ann Otol Rhinol Laryngol Suppl 1999; 177: 119-23.
7. Stelmachowicz PG, Hoover BM, Lewis DE, Kortekaas RW, Pittman AL. The relation between stimulus context, speech audibility, and perception for normal-hearing and hearing-impaired children. J Speech Lang Hear Res 2000; 43(4): 902-14.
8. Kent RD, Weismer G, Kent JF, Rosenbek JC. Toward phonetic intelligibility testing in dysarthria. J Speech Hear Disord 1989;54(4):482-99.
9. Tye-Murray N, Barkmeier J, Folkins JW. Scaling and transcription measures of intelligibility for populations with disordered speech. J Speech Hear Res 1991;34(3):699-702.
10. Brannan MG, Hodson BW. Intelligibility/Severity measurements of prekindergarten children's speech. Am J Speech Lang Pathol 2000;9:141-50.
11. Kent R, Miolo G, Bloedel S. The intelligibility of children's speech: a review of evaluation procedures. Am J Speech Lang Pathol 1994;3:81/95.
12. Sitler RW, Schiavetti N, Metz DE. Contextual effects in the measurement of hearing-impaired speakers' intelligibility. J Speech Hear Res 1983;26(1):30-5.
13. Yoshinaga-Itano C. Early intervention after universal neonatal hearing screening: impact on outcomes. Ment Retard Dev Disabil Res Rev 2003;9(4):252-66.
14. Swanepoel D, Ebrahim S, Joseph A, Friedland PL. Newborn hearing screening in a South African private health care hospital. Int J Pediatr Otorhinolaryngol 2007;71(6): 881-7.
15. Quittner AL, Leibach P, Marciel K. The impact of cochlear implants on young deaf children: new methods to assess cognitive and behavioral development. Arch Otolaryngol Head Neck Surg 2004;130(5):547-54.

16. Borg E, Edquist G, Reinholdson AC, Risberg A, McAllister B. Speech and language development in a population of Swedish hearing-impaired pre-school children, a cross-sectional study. Int J Pediatr Otorhinolaryngol 2007; 71(7): 1061-77.
17. Robbins AM, Svirsky M, Kirk KI. Children with implants can speak, but can they communicate? Otolaryngol Head Neck Surg 1997;117(3 Pt 1):155-60.
18. Rescorla L, Mirak J. Normal language acquisition. Semin Pediatr Neurol 1997;4(2):70-6.
19. Daneshmandan N, Borghei P. Speech intelligibility development in severe to profound hearing-impaired children in iran. Acta Medica Iranica 2007;45(1):35-42.
20. Waltzman SB, Robbins AM, Green JE, Cohen NL. Second oral language capabilities in children with cochlear implants. Otol Neurotol 2003;24(5):757-63.
21. Prasad B. Problems of hearing impaired children and suggested solutions. ICCW News Bull 1992;40(2):11-7.
22. Low WK, Pang KY, Ho LY, Lim SB, Joseph R. Universal newborn hearing screening in Singapore: the need, implementation and challenges. Ann Acad Med Singapore 2005;34(4):301-6.
23. Olusanya BO, Luxon LM, Wirz SL. Benefits and challenges of newborn hearing screening for developing countries. Int J Pediatr Otorhinolaryngol 2004;68(3):287-305.