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Original Research Article

Impact of early intervention of speech and language therapy among hearing impaired child

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ABSTRACT

Background: Hearing impairment is a factor that directly compromises the individual's language which can affect emotional and academic defects by delayed development of communicative ability. This can vary according to the type and degree of hearing loss. Speech therapy intervention is important, along with the use of sound amplification devices, so that the child may have a chance to develop speech, consequently learning and re-habilitation to the society. Aims of the present study was performed to assess the effectiveness of early intervention of speech and language therapy after use of hearing aids to hearing impaired children on their syntactic and lexical development.
Methods: This quasi-experimental study conducted on 100 children having different degree of hearing loss at department of Neurology and department of ENT, King George's Medical University, Lucknow, Uttar Pradesh. After collecting socio-demographic data of subjects by observation, completion of questionnaires, and speech recording by audiologist; Speech and language therapy provide by audiologist for six month after providing hearing aids and improvement in their syntactic and lexical development recorded.
Results: There is significant improvement in verbal response from 14% before therapy to 81% after therapy and non-verbal response before therapy was 86% and after therapy was 19%. Before giving speech and language therapy to subjects pointing score was 24%, sign language was 10% and words response was 0% which increases after therapy were 1%, 2% and 39% respectively. Early identified/intervened hearing-impaired children had a notable positive difference in all assessed lingual gains.
Conclusions: This is study results definitely point to positive effects of intensive and continuous application of speech and language therapy to syntactic and lexical development of hearing impaired children.

Keywords: Communication, Expression, Hearing impaired children, Speech and language therapy

INTRODUCTION

First years of life are critical for the development of auditory and language abilities. This period that is the peak of the process of maturation of the central auditory system and neural plasticity occurs in the auditory pathway. Patients with hearing loss require that the diagnosis be made early so that a reduced impact on language development, auditory and cognitive abilities occurs. Thus, the interval between the suspected hearing loss, diagnosis and intervention should be minimised.[1-3] Hearing loss is the most common sensory deficit in humans today. It was estimated that the number of person with hearing disability per 100000 persons was 291; it was higher in rural (310) compared with urban regions.[4] Hearing impairment is a factor that directly compromises the individual's language. This can vary according to the type and degree of hearing loss. It is known that

sensorineural hearing loss is severe to profound that can cause more damage to languages, making the acquisition and development of oral language, especially in children with pre-lingual hearing loss. Language acquisition is a process dependent on the integrity of the auditory system and when it is damaged by a hearing loss. It is important to speech therapy intervention, along with the use of sound amplification devices, so that the child may have a chance to develop speech, consequently learning and expanding their knowledge of the world. Language development is essential to the child's entry into the symbolic world, so that they can reach levels of greater complexity in language. The symbolic function is the ability to represent the lived world and is composed of language, symbolic play, imitation, problem solving by combination of actions and mental imagery.[5] Regarding speech and language development, recent research showed that children with cochlear implant use age-appropriate learning strategies. They also have appropriate level of expressive vocabulary and semantic feature knowledge as children with normal hearing. Generally, their cognitive capacities are adequate in process for managing use and knowledge of words as in children with normal hearing.[6]

Educational Audiology is the area of speech therapy that treats the relationship of hearing and language. For this type of therapy to be successful, the use of hearing aids or cochlear implants is essential. Studies say that hearing aids allows the hearing impaired children greater access to acoustic information from the sounds of language, which creates more chances for oral language development. This technology is suitable for various types and degrees of hearing losses.[7]

The aim of this study is to determine the effectiveness of speech and language therapy in lexical and syntactic development of hearing impaired children, who are using hearing aids or cochlear implants.

Aim and objective of study is to assess the level of hearing and syntactic ability of hearing impaired children, to see the effectiveness of speech and language therapy on syntactic and lexical ability of hearing impaired children.

METHODS

This quasi-experimental study conducted at the department of Neurology and department of ENT, King George's Medical University, Lucknow, Uttar Pradesh. The samples for this study were six month to ten years old children suffering from hearing impairment. A total of 100 subjects with the above-mentioned problems were selected through convenience sampling method from those who come to neurology department for hearing assessment. Inclusion criteria were hearing impaired children between the ages of 6 month to 10 years, presence of any parents in the family and willingness to come for speech therapy for six month. The study was approved by the ethical committee of KGMU, Lucknow and written informed consent was obtained from parents of all study participants. After recording socio-demographic variables of subjects, speech and language therapy given to subjects for six month with the help of audiologist. Quantitative data of subjects recorded were age of the subject, degree of hearing loss, age at which child detected for hearing impairment and the age at which amplification was given. Qualitative data recorded were mode of communication, expression and comprehension before and after giving speech and language therapy for six months with hearing aids or cochlear implants.

RESULTS

Socio-demographic profile of subject showed that 58% of subjects were female and rest 42% were male. Age wise classification of subjects showed that 33% of subjects equally distributed between 6 month to 2.5 years and 2.6 to 5 years age group and only 10% of subjects were between 7.6 to 10 years age group.

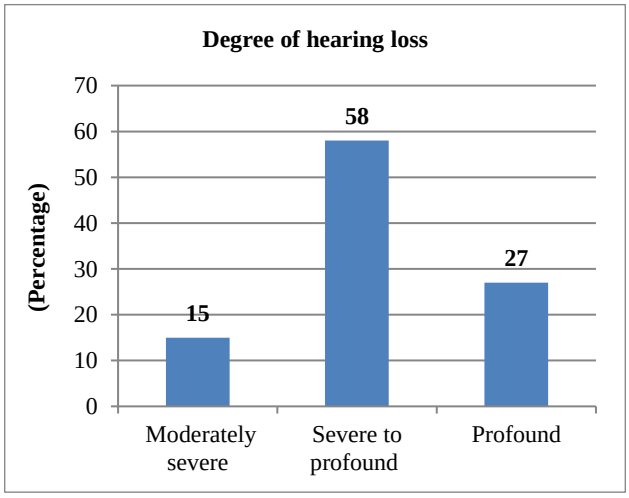

Figure 1: Distribution of subject according degree of hearing loss.

Majorities (58%) of subjects were having severe to profound hearing loss and 27% were having profound hearing loss and rests 15% were having severe hearing loss (Table 1, Figure 1).

Result of age at which hearing loss detected showed that majority (56%) of subjects were detected at the age between one to three years, 19% of subjects detected at the age of 3 months to 12 months and 17% and 8% of subjects detected between 3 to 5years and 5 to 7years age groups respectively.

Results of age at which amplification devices gives showed that majority (54%) of subjects using amplification device at age between 1 to 3 years and 25% and 20% between 3 to 5 years and 5 to 7 years respectively (Table 1).

Table 1: Socio-demographic variables.

Age	0-2.5 years	33
	2.6-5 years	33
	5.1-7.5 years	24
	7.6-10 years	10
Gender	Male	42
	Female	58
Degree of hearing loss	Moderately severe	15
	Severe to profound	58
	Profound	27
Age at which hearing loss detected	3 months to 12 months	19
	1 to 3 years	56
	3 to 5 years	17
	5 to 7 years	8
	7 to 10 years	0
Age at which amplification device was given	1 to 3 years	54
	3 to 5 years	25
	5 to 7 years	20
	7 to 10 years	0
	Not given	1

Table 2. Pre-test and post test score of mode of communication of subjects.

Mode of communication	Pre	Post
Verbal	14	81
Non Verbal	86	19

Response of speech and language therapy results showed that there is significant improvement in verbal response from 14% before therapy to 81% after speech and language therapy and non-verbal response before speech therapy was 86% and after therapy was 19% (Table 2).

Before giving speech and language therapy to subjects pointing score was 24%, sign language was 10% and words response was 0% which increases after therapy were 1%, 2% and 39% respectively (Table 3).

Table 3: Pre-test and post test score of expression of subjects.

Expression	Pre	Post
Gesture	38	0
Pointing	24	1
Sign Language	10	2
Sound	20	14
Word	8	39
Sentences	0	44

Comprehension results showed that before therapy sign language score were 5% which decreases after therapy to 1%, simple commands score before therapy was 10% which increase after therapy to 36% and integration score before therapy was 0% and after therapy significantly increases to 33% (Table 4).

Table 4: Pre-test and post test score of comprehension of subjects.

Comprehension	Pre	Post
Gesture	54	1
Sign language	5	1
Words	31	29
Simple commands	10	36
Different interrogative forms	0	33

DISCUSSION

This study result showed that 58% of subjects have severe to profound hearing loss, 27% have profound and rest 15% were having moderate to severe hearing loss. The process of learning-based speaking and writing is weaker in hearing-impaired children than in normal-hearing children.[8] Hearing loss restricts the rate of development of vocabulary in hearing-impaired children in comparison with normal hearing cases. This difference will be more pronounced in older-aged children.[9] Poor auditory perception compromises spontaneous speech and language development and leads to smaller or larger delays in its development.[10] Tomblin J et al. stated in his study that Children with mild and moderate HL have good outcomes with regard to language and academic performance.

Children with moderately-severe losses were less skilled in language and reading than the CNH and CHH children with mild and moderate losses.[11] In this study most (56%) of the subject's detection of hearing loss age between one to three years and only 8% of subjects hearing loss detected at the age of five to seven years. Based on the results of this study, the importance of early identification/ intervention of hearing loss is supported. Early detection of hearing loss and timely decision making of hearing aids or cochlear implantation can help hearing impaired children to gain normal development and help the ability of understanding and expression of verbal language and other skills. Late identification/intervention of hearing loss results in development of a restricted vocabulary, grammatical problems and academic difficulties.[12] Earlier studies have shown that the mean age of hearing-loss intervention in Persian hearing-impaired children was 3-6 years and found it has more recently been reduced to 2.5 years.[13] Now, the technology has made it easier to identify/ intervention the hearing loss at younger ages.

Identification/ intervention of hearing loss before the age of 6 months provides the possibility of language acquisition in hearing-impaired children in the same way as same as normal-hearing children, and reduces lingual abnormalities in these children.[8] This study results consistent with findings of Elahe S. et al. stated that early identification/ intervention of hearing loss develops the hearing-impaired child's lingual gains in visual vocabulary, grammatical completion, word

differentiation, phonologic analysis, and word production.[9] Pimperton H. et al. also confirmed in his study that early identification of hearing loss and appropriate intervention before the age of 6 months can increase the possibility of normal speech and language development in hearing-impaired children.[14,15] Different researcher demonstrated the importance of age of detection in determining outcomes.[16-18]

In this study 58% of subjects were female and 42% were male. Study of Elahe S et al. stated that there is no effect of gender on language development of hearing-impaired children if they receive appropriate intervention.[9] But Zarifian T et al. found that the effects of gender on improvement in lingual ability are seen only at the beginning of language acquisition.[19] In different studies, the impact of factors such as the child's age at the time of surgery, participation in rehabilitation programs, duration of rehabilitation services, family education level and the presence of other disabilities have been investigated in promoting auditory, speech, and language skills. In this study most (54%) of subjects used amplification device at age between one to three years and 25% and 20% used at age between three to five years and five to seven years respectively. Many researchers signifies the importance of early use of amplification device in their studies. Murria A et al. concluded in his study that hearing impaired children who have received appropriate and early hearing aid assessment and fitting at the age of 3 months and cochlear implantation at the age of 9 months can reach normal language development in up to 96% of cases. There is increasing evidence for a positive effect of early intervention in the form of fitting of hearing aids.[20-23] After giving six month of speech and language therapy to hearing impaired children there was significant improvement in their verbal response which increases from 14% before therapy to 81% after therapy. the process of learning-based speaking and writing is weaker in hearing-impaired children than in normal-hearing children.[8]

This result is consistent with the findings of Yoshinaga-Itano et al. stated that the mean length of speech in children with early identified/intervened hearing impairment is greater than that in late identified/ intervened children.[24] Davidson L et al. confirmed that children with cochlear implant could benefit from treatment focused specifically on learning language structures, despite their phonological deficits as a consequence of reduced auditory perception. Other research pointed to fact that acquiring spoken vocabulary is facilitated by good audibility which is provided with a cochlear implant as well as with memory abilities and phonological learning.[25]

After giving speech and language therapy to study subjects there is significant improvements in their expression and comprehension score. The process of learning-based speaking and writing is weaker in hearing-impaired children than in normal-hearing children.[8] Early identification/ intervention of hearing loss before the age of 6 months enables normal lingual/ cognitive development in hearing-impaired children regardless of their degree of hearing loss, gender, race, socioeconomic level and communicative methods. His study also revealed that children with early identified/intervened hearing loss have higher expressive language scores.[26] The mean length of speech in children with early identified/intervened hearing impairment is greater than that in late identified/ intervened children.[24]

Many research which are dealing with language development in children with cochlear implants suggest that there is good reason to suspect that even the most successful children with cochlear implants have lexical processes and representations that differ from children with normal hearing, particularly with respect to phonological representations and processing.[27] Ljiljana J et al. also found that achievements of children with cochlear implants and those with hearing aids were almost identical in the domain of active vocabulary development.[28]

The children with early identified/ intervened hearing impairment also use more vowels, consonants, morphemes and words in their conversations than their late counterparts.[24] Yoshinaga-Itano who showed that early identification/ intervention of hearing loss before the age of 6 months enables normal lingual/ cognitive development in hearing-impaired children regardless of their degree of hearing loss, gender, race, socioeconomic level and communicative methods.[26]

This study results definitely point to positive effects of intensive and continuous application of speech and language therapy to syntactic and lexical development of hearing impaired children.

CONCLUSION

Early identification/ intervention of hearing loss develop the hearing-impaired child's lingual gains in visual vocabulary, sentence formation and expressive ability. This study point to positive effects of intensive and continuous application of speech and language therapy to communication and language development of hearing-impaired children.

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REFERENCES

1. Pinto MM, Raimundo JC, Samelli AG, Carvalho ACM, Matas CG, Ferrari GMS et al. Idade no diagnóstico e no início da intervenção de criançasdeficientesauditivasem um serviçopúblico de saúdeauditivabrasileiro. Arq. Int. Otorrinolaringol. Intl. Arch. Otorhinolaryngol. 2012;16(1):44-9.
2. Theunissen M, Swanepoel DW. Early hearing detection and intervention services in the public health sector in South Africa. Int J Audiol. 2008;47(1):23-9.
3. Nóbrega M, Weckx LLM, Juliano Y, Novo NF. Aspectosdiagnósticos e etiológicos da deficiênciaauditivaemcrianças e adolescentes. Rev Paul Pediatr. 1998;16(1):28-43.
4. NPPCD, Ministry of Health and Family Welfare, guideline for 5 year plan.
5. Quintas TD, Curti LM, Goulart BN, Chiari BM. Caracterização do jogo simbólico em deficientes auditivos: estudo de casos e controles. Pró-Fono Revista de Atualização Científica. 2009 Dec;21(4):303-8.
6. Löfkvist U, Almkvist O, Lyxell B, Tallberg IM. Lexical and Semantic ability in Groups of Children with Cochlear Implants, Language Impairment and Autism Spectrum Disorder. Int J Pediatr Otorhinolaryngol, Feb 2014; 78(2):253-63.
7. Zanichelli L, Gil D. Porcentagem de Consoantes Corretas (PCC) emcrianças com e semdeficiênciaauditiva. J Soc Bras Fonoaudiol. 2011;23(2):107-13.
8. Effects of hearing loss on development. Am Speech Language Hearing Soc. 2011.
9. Elahe S, Zahra J. Effect of Early Intervention on Language Development in Hearing-Impaired Children. Iranian J Otorhinolaryngol, 2016:28(1);84.
10. Barlov I, Pantelić S. Auditory abilities in relation to gender and different etiological factors. Speech and Language, 6th International Conference on Fundamental and Applied Aspects of Speech and Language, IEPSP, Belgrade. 2003: 473-478.
11. Tomblin JB, Oleson J, Ambrose SE, Walker EA, McCreery RW, Moeller MP. Aided Hearing Moderates the Academic Outcomes of Children With Mild to Severe Hearing Loss. Ear and Hearing. 2020 May 4.
12. Bush ML, Bianchi K, Lester C, Shinn JB, Gal TJ, Fardo DW, Schoenberg N. Delays in diagnosis of congenital hearing loss in Rural children. J Pediat. 2014;164(2):393-7.
13. Nemati P, Soleymani Z, Moradi A, Jalaei S. Comparison of some language characteristics between dyslexic children aged 7 8 years old and normal ones. Novin Reh. 2009;2(3-4):40-6.
14. Pimperton H, Kennedy CK. The impact of early identification of permanent childhood hearing impairment on speech and language outcomes. Arch Dis Child 2012;97(7):648-53.
15. Olzinger HD, Felling J, Beitel C. Early onset of family centered intervention predicts language outcomes in children with hearing loss. Int J Pediat Otorhinolaryngol. 2011;75(2):256-60.
16. Stelmachowicz PG, Pittman AL, Hoover BM, Lewis DE, Moeller MP. The importance of high-frequency audibility in the speech and language development of children with hearing loss. Archives of Otolaryngol Head and Neck Surg. 2004 May 1;130(5):556-62.
17. Walker EA, Holte L, McCreery RW, Spratford M, Page T, Moeller MP. The influence of hearing aid use on outcomes of children with mild hearing loss. J Speech, Language, and Hearing Research. 2015 Oct;58(5):1611-25.
18. Walker EA, Holte L, McCreery RW, Spratford M, Page T, Moeller MP. The influence of hearing aid use on outcomes of children with mild hearing loss. J Speech, Language, and Hearing Research. 2015 Oct;58(5):1611-25.
19. Zarifian T, Mohamadi R, Mahmoudi Bakhtiyari B. Syntactical Skills of Persian Hearing Impaired and typically normal children: A Comparative Research: University of Social Welfare and Rehabilitation Sciences. 2010.
20. Murria A, Guerzonia L, Fabrizib E, Marian V. Preschool children have better spoken language when early implanted. Int J Pediatoto Rhinoloryngol. 2014;78(8):1327-31.
21. Friedmann N, Szterman R. Syntactic movement in orally trained children with hearing impairment. J Deaf Studies and Deaf Education. 2006 Jan 1;11(1):56-75.
22. Koehlinger KM, Van Horne AJ, Moeller MP. Koehlinger KM, Van Horne AJ, Moeller MP.Grammatical outcomes of 3- and 6-year-old children who are hard of hearing. J Speech Lang Hear Res. 2013; 56(5):1701-14.
23. Tomblin J, Harrison M Tomblin JB, Harrison M, Ambrose SE, Walker EA, et al. Language Outcomes in Young Children with Mild to Severe Hearing Loss. Ear Hear. 2015;36;1(1):76S-91S.
24. Yoshinaga-Itano C, Apuzzo M, Coulter D, Stredler-Brown A. The effect of early identification of hearing loss on developmental outcomes. Annal Infant Hearing Screening Seminars. 1996.
25. Davidson LS, Geers AE, Nicholas JG. The effects of audibility and novel word learning ability on vocabulary level in children with cochlear implants. Cochlear Implants Int. 2014 Jul;15(4):211-21.
26. Yoshinaga-Itano C. From Screening to Early Identification and Intervention: Discovering Predictors to Successful Outcomes for Children With Significant Hearing Loss. J. Deaf Stud. Deaf Educ. 2003;8(1):11.
27. Schwartz RG, Steinman S, Ying E, Ying Mystal E, Houston DM. Language Processing in Children with Cochlear Implants: A Preliminary Report on Lexical

Access for Production and Comprehension. Clin Linguist Phon. 2013 Apr; 27(4):264-77.
28. Ljiljana J, Ninoslava R. Positive effects of hearing and speech rehabilitation on lexical fund quality in hearing impaired children. Military-medical and Pharmaceutical Review. 2016.

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