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Effect of Hearing Impairment on Receptive Language Development among Children Between 2-5 Years

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A B S T R A C T

Background: Hearing is the process of sound reception by the ear, its manipulation and conduction to brain. The ability to understand words and language is called receptive language. Some children may appear to understand oral language because they may be able to pick up key words and get visual information from surrounding or from gesture even they have difficulty in understanding oral language.

Objective: The study objective was to check the effect of hearing impairment on receptive language development among children between 2-5 years.

Methodology: This cross sectional study was conducted at the department of Developmental and Behavioral pediatric, Children Hospital Lahore. A total of 45 patients were evaluated to check effect of hearing impairment on receptive language with an age range of 2-5 years. A Performa was used for each patient with respect to his/her age, which was filled out based on history and clinical observation. All the data was entered in SPSS (statistical package for social sciences) for the purpose of analysis.

Results: 45 patients with age range of 2-5 years with diagnosis of Moderate Hearing loss were selected. With an age range of 2-3 years most common problems of patients were in vocabulary reception of 500-900 words, identification in 4-5 body parts and understanding of singular and plural things and least common was in telling his/her age by fingers. With an age range of 3-4 years most common problems of patients in vocabulary reception of 1200-2000 words, couldn't understand concept of yesterday and today, had no recognition of three shapes and couldn't understand simply why questions and least problem was in identification of loud and soft sounds. With an age range of 4-5 years most common problem in patient was in following three steps command and least problem was in responses to inside, outside, behind and on top.

Conclusion: It is concluded that receptive vocabulary was delayed in children with moderate hearing loss.

Introduction

Hearing is the process of sound reception by the ear, its manipulation and conduction to brain.[1]

Hearing loss may be defined as medically, educationally and culturally. Hearing loss (HL) is characterized at levels from mild to profound hearing loss, also described in terms of shared cultural identity among individuals who are deaf or hard of hearing.[2] Hearing loss is due to problem with the vibrations of ear drum, resulting in failure of conduction of vibration to sensory part of inner ear it may be due to the neurological problem. Causes of conductive hearing loss are, Congenital Causes: Fixation of stapes footplate, Fixation of malleus head, Acicular discontinuity, Congenital Cholesteatoma.[3] A sensor neural hearing loss occurs when cochlear hair cells or acoustic nerve are damaged. Causes of Sensorineural

hearing loss are divided in to Congenital Causes: Abnormalities of inner ear, Damage to hearing apparatus due to prenatal and perinatal factors and Acquired Causes are Hearing Loss due to noisy environment, Effect of some static drug, Presbycusis, Meniere's disease, Systemic disorders. A mixed HL is combination of both conductive and SNHL.[4]

These are following levels of hearing loss Mild Hearing Loss (25-40 db): Individuals with mild degree hearing loss have difficulty in hearing faint speech even if the environment is quiet. Discussion in the class room is challenging to follow. [5] 50% of class discussion is missed by them. Even mild hearing loss can significantly interfere with the reception spoken language and education performance. Moderate Hearing Loss (41-65 db): At close distance individuals with moderate hearing loss can hear conversational speech. Activities in group such as group discussions present a communicating challenge. Moderate hearing impaired children can hear vowels better as compared to consonants.[6] Severe Hearing Loss (66-89db): Individuals with severe degree hearing loss can't hear conversational speech until it is amplified and even then can't recognize many of words. The individual's speech is not altogether intelligible.[5] There was marked educational retardation and learning disabilities. Profound Hearing Loss (90db or greater): Individuals with profound hearing loss can't hear conversational speech at all but may hear loud sounds. Vision is primary modality for communication.[7]

The ability to understand words and language is called receptive language. It involves getting information and their meaning from routine (e.g. we have finished our homework and so next it is time to play), visual information from the surrounding (e.g. dad holding his car's key means we are going for outing, red light means stop), sounds and words (e.g. siren means an ambulance is coming down the street, the word football means a round bouncy thing with which we play), concepts such as time, weight, shapes and colors, grammar and written information (e.g. sign on the road like "no parking" written tales). Some children may appear to understand oral language because they may be able to pick up key words and get visual information from surrounding or from gesture even they have difficulty in understanding oral language (words and talking). Some building blocks which are necessary to develop receptive language: Attention and concentration: Continuous effort to do any activity without any distraction and being able to hold that effort for enough time until task was completed. Pre-language skills: A communication in which there is no word. Communication is done by eye contact, imitation, facial expressions, gestures and joint attention. [8]

Rance et al. (2007) conducted a comparative study in which they compared receptive vocabulary and speech production abilities of children with auditory neuropathy/dysynchrony (AN/AD) with sensor neural hearing loss children of similar age and degree was compared. 12 children with an age range 57 to 167 month was evaluated. Speech abilities were evaluated using Diagnostic Evaluation of Articulation and Phonology (DEAP) and speech intelligibility rating scale, and language abilities were evaluated with Peabody Picture Vocabulary Test (PPVT). Receptive language and speech production were delayed in each AN/AD relative to normal children. PPVT Language quotient score was 0.65+/- 0.19 and average number of pronunciation error was 11+/- 8.4% larger than expected for this age, but similar with sensor neural hearing loss. [9] Another study conducted on phonological skills, language abilities and literacy score. Four groups (sensor neural hearing loss, specific language impairment and two control group) were compared. Results show, 50% phonological impairment with receptive, expressive vocabulary and high hearing threshold than remaining without phonological impairment. Non word deficit in SNH is greater in both with or without phonological impairment and it was similar with SLI. [10]

Under a study for evaluation of impact of hearing loss, age and other factors on language, academic, social and intellectual behavior of children 40 hearing impaired children were evaluated. Although intellectual level varied person to person but any level of hearing loss strongly affects the psycho educational development of children, leading to language and learning problems.[11] Link between mild to moderate hearing loss and language impairment in adolescents with an age of 11-15 years was evaluated and compared with normally developing and with specific language impairment. Results explained that Language scores significantly linked with degree of hearing loss. But these results were of adolescents at this

age language development was completed. So we couldn't generalize it because severity of hearing loss was found only after childhood. [12]

After identification of moderate hearing impairment researcher could guide the parents regarding the problem and so that they can go to rehabilitation center to prevent their children from future problems regarding their communication and socialization. The objective of this study is: To check out the effect of moderate hearing impairment on receptive language delay of age 2-5 years old children.

Methodology

This Cross-sectional study was conducted in Department of Developmental & Behavioral Pediatrics CH & ICH; Lahore during September 2015 to November 2015. Data was collected through questioner developed from literature review and expert opinion. 45 participants were selected through convenient sampling technique. These participants were divided into three groups according to the age group A (2-3 year), group B (3-4 year), group C (4-5 year). Inclusion criteria of the population include Individuals with an age range from 2 years to 5 years and Individuals with Moderate Hearing Impairment (both sensor neural and conductive). The exclusive criteria include Patients with hearing, Patients having cochlear implant, and patients how have other comorbid condition with hearing impairment. Before the sampling permeation was taken from institute and consent from was singe by parents of the participants. All patients fulfilling the inclusion criteria were evaluated by researcher for receptive language in department of developmental and behavioral pediatrics using Portage guide for early education (PGEE). SPSS was used for data analysis. Component bar charts were made with the help of SPSS and tables were made on Excel.

Results

A total of 45 patients of different age ranges were selected by purposive sampling 15 patients were of age range of 2-3 years, 15 were of age range of 3-4 years and 15 were of age range of 4-5 years as shown in table I.

Table I: Frequency Distribution of Gender

Gender	2-3 years	3-4 years	4-5 years
Male	11(73.3%)	10 (66.7%)	11(73.3%)
Female	4 (26.7%)	5 (33.3%)	4 (26.7%)
Total	15 (100.0%)	15 (100.0%)	15 (100.0%)

In 2-3 years age range out of 15 patients, 15(0.00%) patient had not receptive vocabulary of 500-900 words, 6 (40.0%) patients couldn't identify 4-5 body parts, no (0.00%) patient had understanding of singular and plural things, 15 (100.0%) patient couldn't understand difference between one and all, 6 (40.0%) patients had not concept of at least three propositions, 2 (13.3%) patients couldn't understand the use of everyday objects, 2 (13.3%) patients didn't made a choice when asked. 5 (33.3%) patients couldn't act in response to action words, 9 (60.0%) patients couldn't understand how to tell his/her age on fingers and 5 (33.3%) patients couldn't point to boy or girl on verbal command as shown in table II.

Table II: Frequency Distribution of 3-4 Years Patients for Effect of Hearing Impairment on Receptive Language

Questions	Yes	No
Has receptive vocabulary of 500-900 words	0 (0.0%)	15 (100.0%)
Can identify 4-5 body parts	9 (60.0%)	6 (40.0%)
Has understanding of singular, plural things (book – books)	0 (0.0%)	15 (100.0%)
Can understand difference between one and all	0 (0.0%)	15 (100.0%)
Has concept of at least three propositions (e.g in, on, under)	9 (60.0%)	6 (40.0%)
Can understand the use of everyday objects (e.g spoon is for eating)	13 (86.7%)	2 (13.3%)
Makes a choice when ask	2 (13.3%)	13 (86.7)
Can acts in response to action words	5 (33.3%)	10 (66.7%)
Can understand how to tell his/her age on fingers	9 (60.0%)	6 (40.0%)
Can point to boy or girl on verbal command	5 (33.3%)	10 (66.7%)

In 3-4 years age range out of 15 patients, 15 (100.0%) patient had not receptive vocabulary of 1200-2000 words, 7 (46.7%) patients had not recognition of basic colors, 11 (73.3%) patients couldn't follow two step command, 13 (86.7%) patients couldn't understand concept of opposites, 15 (100.0%) patients couldn't understand the concept of yesterday and today, 4 (26.7%) patients couldn't follow instructions in a group setting, 0 (0.00%) patients couldn't identify soft and loud sounds. 15 (100.0%) patients had not the recognition of three shapes, 8 (53.3%) patients couldn't understand simple how questions and 15 (100.0%) patients couldn't understand simple why questions as shown in table III.

Table III: Frequency Distribution of 3-4 Years Patients for Effect of Hearing Impairment on Receptive Language

Questions	Yes	No
Has receptive vocabulary of 1200-2000 words	0(0.0%)	15(100.0%)
Has recognition of basic colors	8(53.3%)	7(46.7%)
Can follow two step command	4(26.7%)	11(73.3%)
Can understand concept of opposites (e.g. go – stop)	2(13.3%)	13(86.7%)
Started to understand the concept of yesterday and today	0(0.0%)	15(100.0%)
Can follow instructions in a group setting	11(73.3%)	4(26.7%)
Can Identify soft and loud sound	15(100.0%)	0(0.0%)
Has the recognition of three shapes◯,□&△	0(0.0%)	15(100.0%)
Can understand simple How Questions	7(46.7%)	8(53.3%)
Can understand simple Why Questions	0(0.0%)	15(100.0%)

In 4-5 years age range out of 15 patients, 4 (26.3%) patients couldn't point to ten body parts on verbal command, 14 (93.3%) patients couldn't follow three steps command, 5 (33.3%) patients couldn't recognize some alphabet letters, 7 (46.7%) patients couldn't act in response to inside, outside, behind and on top, 9 (60.0%) patients couldn't take turn, 9 (60.0%) patients couldn't understand passive sentence (e.g. Boy hit girl --- Girl hit by boy), 5 (33.3%) patients hadn't understanding of top and bottom of items, 4 (26.7%)patients hadn't understanding of some and many, 4 (26.7%) patients couldn't point absurdities in pictures and 12 (80.0%) couldn't understand temporal concepts (Before/After) as shown in IV.

Table IV: Frequency Distribution of 4-5 Years Patients for Effect of Hearing Impairment on Receptive Language

Questions	Yes	No
Can point to ten body parts on verbal command	11 (73.3%)	4 (26.7%)
Can follow three steps command	1 (6.7%)	14 (93.3%)
Can recognition some alphabet letters	10 (66.7%)	5 (33.3%)
Can acts in response to inside, outside, behind and on top	8 (53.3%)	7 (46.7%)
Can take turn	6 (40.0%)	9 (60.0%)
Can understand passive sentence(e.g. Boy hit girl - Girl hit by boy)	6 (40.0%)	9 (60.0%)
Has understanding of top and bottom of items	10 (66.7%)	5 (33.3%)
Has understanding of some and many	11 (73.3%)	4 (26.7%)
Can point absurdities in pictures	4 (26.7%)	11 (73.3%)
Can understand temporal concepts(Before/After)	3 (20.0%)	12 (80.0%)

Discussion

Hearing is the process of sound reception by the ear, its manipulation and conduction to brain, any problem in this phenomenon results in hearing loss. Degree of hearing loss varied from mild to profound. Any degree of hearing impairment affected the language abilities including reception and expression of language. [13] The current study was conducted with the objective to check the effect of hearing impairment on receptive language. There were 45 patients of moderate hearing loss evaluated for language reception.

From the point of view of current study it was found that the children of moderate hearing impairment lag in receptive vocabulary relative to normal hearing. These results were identical with the results of who performed the study on AN/AD for evaluation of speech production and language reception and compared it with SNHL. Because moderate hearing impaired children lags in receptive vocabulary therefore this leads them to difficulty in communicating with others. [14] Results of current study showed that language reception was a problem when there was moderate hearing loss and these results was also similar with the work of Brisco et al. (2001) who performed study on sensorineural hearing loss and specific language impairment children for evaluation of

phonological skills, language abilities and literacy scores and compared with their control groups.[10] Language development is related to the development of auditory skills. Hearing impairment results in losses for language development and the greater is the degree of the hearing loss, the greater is the difficulty of speech perception and discrimination and language deficits. [15] Same results are being depicted by the current study. Vocabulary develops more slowly in children who have hearing loss.

Children with hearing loss learn concrete words like cat, jump, five, and red more easily than abstract words like before, after, equal to, and jealous. They also have difficulty with function words like the, an, are, and a. The gap between the vocabulary of children with normal hearing and those with hearing loss widens with age. Children with hearing loss do not catch up without intervention. Children with hearing loss have difficulty understanding words with multiple meanings. For example, the word bank can mean the edge of a stream or a place where we put money. [16] Current results show the same fact that as the age advances gap between receptive language age and hearing age also widens.

Conclusion

It is concluded that children with moderate hearing impairment were delayed in receptive language. Literature review related to study had also supported results of current study. Suggestions for followers who will do research for this study purpose are effect of moderate hearing impairment on expressive language can also be done. Comparison between patients of moderate hearing impairment with or without hearing aid can also be done for receptive and expressive language.

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