

Academic Performance of Hearing Impaired Children Who Received Early Intervention

ABSTRACT

Aims: This study aims to assess the academic performance of children with hearing impairment who received early intervention in Lahore.

Study design: Cross sectional survey design was used.

Place and Duration of Study: Data was collected from Special Institute/School; Hamza foundation academy Lahore, Pakistan for the duration of six months from March 2021 to September 2021.

Methodology:

97 students with moderate to severe sensorineural hearing loss children (aged in between 4 to 12), using hearing aids (HA's) and cochlear implant (CI) were included by using purposive sampling technique. Hearing impaired children with other than sensorineural hearing loss and children who didn't receive early intervention (hearing aids/implants or speech therapy) were excluded from this study.

Results: It was found that 97 children with hearing impairment achieved significantly in their test score (80 to 99%) across English, Science, and Mathematics as compared to Urdu and Islamiyat (70 to 79%) after the implementation of intervention strategies.

Conclusion: The study conclude that, while children with hearing impairment faced struggle in some areas of academics which includes listening and imitation in subjects like Urdu (structure of words) and Islamiyat (due to Arabic talafuz), their academic performance in Math, English, and Science is higher with overall achieved percentage between 80 to 99 %.

Keywords: Early Intervention, Hearing Impairment, Academic Performance, Pakistan

1. INTRODUCTION:

Children with hearing impairment have utmost hurdle in communicating with others. There are many researches that indicate that academic outcome of hearing impaired students are way below their peers. In Pakistan there are more than 1 million school going age deaf and hard of hearing children, but only 5% of them attend school. If early intervention services (hearing devices, speech therapy), early testing and timely diagnosis are not availed, then hearing loss causes difficulty perceiving the sounds normally, thus affect speech causing a lag in their daily routine, social play, or academic performance (1).

Success of every person depends on availability of opportunities around them. But this fact is extremely difficult for a child with any sort of disability whether physical, mental or both. So, if a child with disability in case of hearing impairment, is identified, screened, and diagnosed early at appropriate young age (0-3 years), the child will have normal development and will be able to overcome his late developmental milestones. Academic success of hearing impaired children has been a longstanding concern. An extensive observation showed that children with any sort of hearing loss showed poorer academic outcomes as compared to normal hearing peers. Some indicated that children with moderate-severe hearing loss had academic complications, especially in reading and writing skills (2). Poor reading skills in the pre-school period of HI children was seen but by 2nd grade hearing impaired children had age appropriate outcomes in regard of reading and comprehension (3). Halliday et. al compared group of mild and moderate hearing loss children with a group of dyslexic children and concluded that hearing impaired children had achieved age-appropriate reading abilities than a dyslexic child (4), While few studies stated that there is no difference in intelligence of sensorineural hearing loss child and normal hearing child; yet, they perform poor during assessment tests (5).

There are many factors that strongly influence academic success. These factors and variables often correlate with each other, that they cannot be separated hence have good or bad influence on child, for example; degree of HL is related to receptive, expressive and oral skills, which influence communication in classroom. Similarly, family involvement is related with limited resources and high expectation from children, which pressurize and negatively affect the child, leading to confused academic achievement. (6). Communication factor was also strongly associated with academic achievement. For academic success having good receptive, expressive and communicative skills are needed but in case of hearing impaired children, active involvement in classroom was lacking because of lack of communication skills. (7)

Anju et al. in 2020 conducted the study on academic outcomes and coping skills of children using cochlear implants in mainstream schools in 2020. The results indicated that in oral comprehension 29% of children understood and organized complex instructions. In oral expression, 13% of these children had acquired the normal articulatory skills. In reading, 19.3% were capable of blending sounds correctly to structure words. In writing, 74% of children were able to copy words or sentences without any mistakes. While in Mathematics, 41.9% of children completed numerical tasks within the same accuracy and speed as their class fellows with normal hearing. According to teachers, 71% children performed above average in all academic domains. Positive affect of early intervention, appropriate implantation age, auditory verbal therapy and support of the parents and teachers on academic outcomes of hearing impaired children. (8) J. Bruce et al. in 2020 observed the academic outcomes of children with mild-severe hearing loss. It was concluded that children with mild to moderate hearing loss had good verbal communication and academic outcome, while the children with moderate to severe loss had poor language skills. These findings highlight the significance of clinical interventions i.e. aided hearing devices, with early intervention. (9)

Nassrallah F. et al. in 2018 explained about the language and literacy skills of school aged children with unilateral and mild-moderate bilateral hearing loss. They concluded that the

auditory skills and phonological skills of these children was less than normal peers, but other outcomes were within the range of their normal hearing peers. (10)

Meeting the educational needs of children with hearing loss written by LeClair KL, Saunders JE. in 2019 states that the most growing and concerning public health issue is pediatric hearing loss. Because children with any sort of hearing loss don't receive proper diagnosis and early treatment, they face difficulty adjusting into mainstream schools due to lack of speech and language skills hence obtain lower educational outcomes. Children with any type of hearing impairment show poor speech and language development which leads to low reading skills, low academic grade performance, reduced social skills and impaired decision-making. (11)

This study aims to examine the academic performance of school going children hearing impaired who had received early intervention services.

2. MATERIAL AND METHODS:

Cross sectional survey design was used. Data was collected from Special School 'Hamza foundation academy' Lahore, Pakistan. The study was completed in six months after the approval of the synopsis from Board of Advanced Studies and Research (BASR). Purposive sampling technique was used. A sample size of 97 students was calculated by software, (Raosoft.Inc. USA, 2011) based on 90% confidence level and 10% error limit. School going hearing impaired children aged in between 4-12 with moderate to severe sensorineural hearing loss using hearing aids (HA's) and cochlear implant (CI) were included for measurement of academic output and hearing impaired children with mild hearing loss and children who didn't receive early intervention (hearing aids/implants or speech therapy) were excluded from this study.

Data was collected in two ways; in stage one the study questionnaire was given to the teachers to measure the effect of early intervention and investigate about the academic performance of hearing impaired children. 20 teachers participated in this study (who was currently teaching grades play to 3). In stage 2, online survey questionnaire was designed on Google forms due to COVID'19 restrictions for result section in which parents and teachers provided the academic result of grade play to 3.

2.1 Statistical Analysis

For data analysis, the responses were scored on Likert scale data (agree, disagree, strongly disagree, and strongly agree). Data was collected by questionnaire comprising of eight major sections with total 20 questions, filled by teachers of recruited students with the categorical data (age, profession, and type of hearing loss), and gathering of academic exam reports from the teachers of 97 recruited students. The response on each question was collected. Data was analyzed with SPSS 25 statistical software and distribution of responses was presented as pie charts, simple bars, descriptive frequency and percentages.

3. RESULTS AND DISCUSSION

3.1 Demographic Distribution of Respondents:

97 children with age range of 4 to 12 years and both male and female were observed.

3.2 Age Range and Grade:

Children age range: 4 to 6 (41%), 6 to 8 (12%), 8 to 10 (19%) and 10 to 12 (28%). The selected grades were early intervention play to grade 3. Playgroup/early intervention 42 students (43%), 11 students of grade 1 (11%), 7 students in grade 2 (7%), and 37 students of grade 3 (37%) participated in this study. [Fig 1A]

3.3 Hearing loss

Children with moderate to severe sensorineural hearing loss were included. 60 children (62%) had moderate sensorineural hearing loss while 37 students (38%) with severe sensorineural hearing loss participated in this study. [Fig 1B]

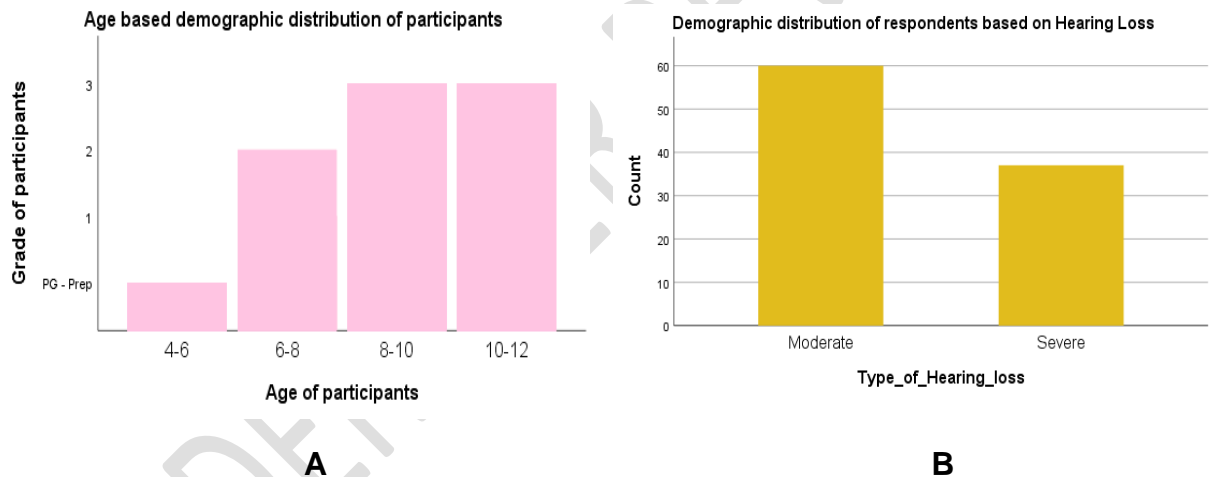


Fig. 1. A: Demographic distribution of respondents based on age and grades B: Demographic distribution of respondents based on type of hearing loss

3.4 Early intervention

Students who had received early intervention services in the form of speech and language therapy after installing hearing aids or cochlear implants (1) were selected. All 97 children who had received were selected.

3.5 Academic performance mark sheets of selected children for data collection.

The academic performance mark sheets of randomly selected sensorineural hearing impaired children were taken for the subjects of English, Urdu, Maths, Science and Islamiyat (grade play group - 3).

English

In English, children with hearing impairment perform very well. With 55.7% scores between 80-89% and 36% obtained 90-99%, 4% in 70-79% and 4% students obtained scores in between 60-69%. This represents that they have hold on to comprehension, pragmatics, syntax, and phonic sounds.

Urdu

In Urdu, we see a huge difference in performance. Due to difference in sounds of alphabets in Urdu and English and difficulty of writing the curves in Urdu, makes it difficult for a child with hearing loss to completely understand. Here 9.3% scored between 60-69%, 53% children with hearing impairment scored between 70 to 79 %, 12.4% in between 80-89% while only 24% students obtained marks between 90 to 99%.

Science

25 hearing impaired students obtained between 90 to 90%, 55% children obtained the score between 80 to 89 %, marks and 17 students obtained in between 70 to 79% and only 1% in 60-69%. These results again deny the claims by previous literatures that children can't understand the concepts and complex structures on primary levels.

Math

77 students (79%) out of 97 obtained scores between 90 to 99%, 11 students (11.3%) between 80 to 89 %, 8 (8.2%) students in between 70 to 79 % and only 1 student had scores between 60-69%.

Islamiyat

36 students (37%) obtained 90 to 99 % while 20 students (20.6%) performed in between 80 to 89 % and 34 students (35%) obtained in between 70 to 79 % and 7 students (7%) in between 60-69%, which pretty much describes the count of Islamiyat subject which includes Talafuz and Arabic words.

DISCUSSION

Teachers were asked about their opinion, how does hearing loss impose challenges on academic performance? Many teachers responded that many children do not communicate with each other which delays their social development. But 70% of teachers pointed out that behavior of society and lack of cooperation from parent's side plays big role in child's improvement in academic development. Some teachers of severe sensorineural hearing loss said that; "If teacher delivers lesson only in verbal, then students face difficulties, if concepts are cleared through pictures or video then they understand and memorize it quickly." This was evident in Brittany McFadden and Andrea Pittman study, which concluded that children do not perform well when given verbal instructions due to the external noise and hearing aid noise, which hence effects their performance (12). **This difficulty may be caused due to language complexity which increases per grade, less visual clues, more verbalizations than visualization, and lack of development of social skills and confidence.** The result discovered that HI children encounter challenges according to type of hearing loss i.e., mild, moderate, severe, and profound. Some teachers reported that children with mild HL had least difficulty

in understanding concepts or working verbally with obtaining marks in between 90% mostly in all subjects, while moderate HL students faced difficulty in some sounds thus obtain in between 80 to 90%, but as hearing loss increase performance decreases; severe HL children suffered confusion, missed sound and lacked understanding concept obtained 70-89% in selected subjects, In the end profound HL, academic performance lies between 60 to 70% with speech problems, cognition and state of confusion. Most of kids with profound hearing loss lip read and need extreme visual cues for their concepts. All these points are evident in the response of questionnaire given to teachers, 80 % agreed that the type of HL and academics are related to each other i.e., 12 Teachers agree to the point that type of hearing loss and onset of HL affects negatively on the academic outcome. Teachers of severe HL children, commented that there is great effect of hearing impairment on children i.e. omit voiceless sounds in speech causing articulation errors, which makes it difficult for them to achieve normal learning skills. Currently, specific syllabus for HI children is not designed. All HI children have to study the same and old outline course approved by the government for special education. To facilitate the hearing impaired children, revision of curriculum for deaf and hard of hearing children was advised, also parents, teachers for exam department as well as schools should be skilled in sign language. (13)

Due to lack of schools especially designed for HI population, there is a big number of children who attend no normal schools. So due to limited learning capability (because of hearing loss), they face problems and difficulties covering all syllabus. Half teachers suggested that hearing impaired children should have specially designed syllabus and sign language teacher in every school. This will not only increase their educational status but also be able to find a normal job. Susan Meadow and Rachel Mayberry reported that when HI children went through typical methods of reading and writing attainment, they had small, shallow vocabulary and wrong sentence construction which missed grammatical rules. (14)

HI children performed poor in examinations with 60% teachers 'Agree' that children with HL perform poor in examinations. But result of hearing impaired children repeat examination grades was 50%, which indicates that children with moderate hearing loss don't repeat often while children with severe hearing loss repeat once or twice. Some teachers said that board examinations and entry test show no consideration in terms of the type of HL, planning questions, and marking paper, time limit also do not match with HI child's speed and learning capacity. Early intervention starts from age 6 months to 3 years has a considerable positive effect on HI child's language growth i.e., visual, oral vocabulary, comprehension, sentences, grammar, word differentiation, word production, semantics, and syntax. (15)

It can be seen that 80% teachers Agree that there is variation in academic accomplishment of children with early intervention and children without early intervention while 60% teachers Strongly Agree that early intervention have positive effect on the academic performance of children. 75% teachers agree and strongly agree that hearing impaired children who received early interventions services achieved good grades in comparison of hearing impaired children who received late intervention. Norio Kasai et al, compared children who received early intervention with late intervention. It concluded that early intervention was significantly related with the improved language development and performance. (16)

About HI assistant teachers, all teachers strongly agreed and stated that it motivates the children to study more. While 100% 'Agree' that the school has a lot of other person who know Sign Language (Pakistan Sign Language/PSL) help children with hearing impairment. Adeogun in 2001 said that "Quality of any educational system depends upon the quality of its teachers and staff members". So, teachers and staff's opinion and recommendations matters in educating the children. (17)

When asked opinion for measures to help children with HL, teachers recommended: use of visual aids, activities based learning, learning with real objects, through pictures, animated gif, or videos, role play, field trips, regular speech therapy, use modern methods and techniques, parents positive attitude and quality time given to HI child, work on visualization, clean environment, availability of proper resources, improved sign language, effective syllabus designed for HI children, coordination with multi-disciplinary team, psychological counseling sessions, and evidence based therapy should be given. Four teachers suggested that learning should be given through pictures, animated gif, or videos, role play and as this will engage them into learning concepts. Three teachers rooted for the activities based learning where children engage with real objects and fun activities, this will allow them to explore and will enhance learning. Zafer Erden et. al conducted study in which 40 HI children (8-10 years) were compared with 40 healthy children. There was no noteworthy difference in age, height, and weight, all test scores of normal children were significantly higher than HI children, but no significant difference in the completion time was noted, which means that by visual perception, both groups completed the test at same time, hence this more emphasis should be placed on use of visual cues and concepts learning with visualization as this technique improves and speed up learning process. (18)

Seven teachers picked Field trips as must for HI children. Due to lack of social communication, HI children need more exposure in order to face society. Batya Engel and Shaima Hamed, 70 children (aged 6–11) did a comparison between 25 children with hearing impairments, 20 children with visual impairments and 25 typical developing children. Hearing and visual impaired children showed limited participation as compared to normal children, both groups had participated in lesser number of activities outside and enjoyed more activities inside of home in front of limited people. Thus, idea for field trips, mart trips, park trips and even small scale are good choice for boosting the confidence of HI children. (19)

All teachers recommended children should have regular speech therapy and most important from parent's support, positive attitude and quality time given to hearing impaired child. More awareness to sign language and its benefits should spread in society, so that people have more access to sign language.

4. CONCLUSION:

This study concluded that there is difference in academic achievement of hearing impaired students compared with normal hearing children. The factors affecting their performance includes i.e., lack of new-born screening, late intervention and diagnosis, late hearing aids or cochlear implant, societal prejudice, lack of parental support and motivation, ignorance of their special needs, and lack of educational support.

CONSENT AND ETHICAL APPROVAL:

This study was conducted after ethical approval obtained from the institutional ethical board (REC: Riphah ethical committee) of Riphah international university. Written consent was taken after explaining the whole procedure to the parents and teachers of the students.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCE:

1. Efua Esaaba Mantey Agyire-Tettey MC, Emma Seyram Hemanoo. Academic Challenges of Students with Hearing Impairment (SHIs) in Ghana. *Disability CBR & Inclusive Development* 28. 2017;29(3).
2. Marschark M, Shaver DM, Nagle KM, Newman LA. Predicting the Academic Achievement of Deaf and Hard-of-Hearing Students From Individual, Household, Communication, and Educational Factors. *Exceptional Children*. 2015;81(3):350-69.
3. Runnion E, Gray S. What Clinicians Need to Know About Early Literacy Development in Children With Hearing Loss. *Lang Speech Hear Serv Sch*. 2019;50(1):16-33.
4. Halliday LF, Bishop DV. Is poor frequency modulation detection linked to literacy problems? A comparison of specific reading disability and mild to moderate sensorineural hearing loss. *Brain Lang*. 2006;97(2):200-13.
5. Agyire-Tettey EEM, Cobbina M, Hamenoo ES. Academic Challenges of Students with Hearing Impairment (SHIs) in Ghana. *Disability, CBR & Inclusive Development*. 2017;28(3):127.
6. Hyde M, Ohna SE, Hjulstadt O. Education of the deaf in Australia and Norway: a comparative study of the interpretations and applications of inclusion. *Am Ann Deaf*. 2005;150(5):415-26.
7. Antia SD, Jones PB, Reed S, Kreimeyer KH. Academic Status and Progress of Deaf and Hard-of-Hearing Students in General Education Classrooms. *Journal of Deaf Studies and Deaf Education*. Summer 2009;14(3):293–311.
8. Anju George JM, Sita Sreekumar. Academic Outcomes and Coping Mechanisms of Children using Cochlear Implants in Mainstream Schools in Kerala, India. *National Institute of Speech and Hearing, Trivandrum, Kerala, India*. 2020;31(4).

9. 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 Hear.* 2020;41(4):775-89.
10. Nassrallah F, Fitzpatrick EM, Whittingham J, Sun H, Na E, Grandpierre V. A descriptive study of language and literacy skills of early school-aged children with unilateral and mild to moderate bilateral hearing loss. *Deafness & Education International.* 2018;22(1):74-92.
11. LeClair KL, Saunders JE. Meeting the educational needs of children with hearing loss. *Bull World Health Organ.* 2019;97(10):722-4.
12. Brittany McFadden AP. Effect of Minimal Hearing Loss on Children's Ability to Multitask in Quiet and in Noise. *Language, Speech, and Hearing services in schools, American Speech-Language-Hearing Association.* July 2008;39:342–51.
13. Bushra Akram RB. Special Education and Deaf Children in Pakistan: An Overview. *Journal of Elementary Education.*22(2):33-44.
14. Susan Goldin-Meadow RIM. How Do Profoundly Deaf Children Learn to Read? *Learning Disabilities Research & Practice, The Division for Learning Disabilities of the Council for Exceptional Children.* 2002;16(4): 222–9.
15. Elahe Shojaei ZJ, Maryam Gholami. Effect of Early Intervention on Language Development in Hearing-Impaired Children *Iranian Journal of Otorhinolaryngology, Vol.* Jan 2016;28(1).
16. Norio Kasai KF, Kana Omori, Akiko Sugaya, Toshiyuki Ojima. Effects of Early Identification and Intervention on Language Development in Japanese Children With Prelingual Severe to Profound Hearing Impairment. *Annals of Otology, Rhinology & Laryngology.* 2012;121(4).
17. Adeogun AA. Instructional resources and school effectiveness in private and public secondary schools in Lagos State. *Lagos Journal of Educational Administration and Planning.* 2001;1(1):74 – 81.
18. Zafer Erden SO, Volga Bayrakci Tunay. Is visual perception of hearing-impaired children different from healthy children. *International Journal of Pediatric Otorhinolaryngology.* 2003;68:281–5.
19. Batya Engel-Yeger SH-D. Comparing participation in out of school activities between children with visual impairments, children with hearing impairments and typical peers. *Department of Occupational Therapy, Faculty of Welfare and Health Sciences, University of Haifa, Israel* 2013;34:3124–32.