



Original Article

Comparison of Communication in Early and Late Identified Children with Hearing Impairment

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ABSTRACT

Background: The significance of early detection and intervention in hearing impairment is well-documented, with substantial evidence suggesting improved language outcomes in children who are identified and receive intervention at an early age.

Objective: To quantitatively compare the communicative abilities of children with hearing impairments identified early versus late and to evaluate the impact of the timing of intervention on their language development.

Methods: In a cohort study of 104 children with hearing impairment, two groups were defined based on the age at identification: early (before 6 months) and late (after 6 months). Using the Communication Checklist-2, as well as standardized tests for receptive and expressive language, we assessed and compared their communication skills.

Results: Early identified children demonstrated superior communication skills, with 47.1% using object pointing compared to 57.4% of late identified children. A significant contrast was observed in verbal communication, with early identified children exhibiting higher usage of creative one-word utterances at 33.3% against 31.5% in the late group. Receptive language scores were higher in the early group by an average of 12 points, while expressive language scores were higher by an average of 15 points. Late identified children showed a higher reliance on preverbal communication, with a 3.7% higher incidence of object self-injury and a 5.2% higher occurrence of object aggression.

Conclusion: The findings emphasize the substantial advantage of early identification of hearing impairment for communication skills development. Early identified children not only show a greater propensity for verbal communication but also achieve higher receptive and expressive language scores, underscoring the need for prompt hearing loss detection and intervention.

Keywords: Early identification, Late identification, Hearing impairment, Communication development, Language outcomes, Pediatric intervention.

INTRODUCTION

Communication, a vital process of transferring information and understanding between individuals, is deeply influenced by emotions, cultural contexts, and modes of expression (1). It requires a range of skills such as attention, verbal and non-verbal communication, empathy, and more (2). This becomes particularly challenging for children with hearing impairment, who often struggle with developing these skills due to their inability to listen and imitate sounds easily (3-6). This struggle can lead to difficulties in sharing ideas, adjusting to their environment, and can significantly impact their self-esteem and confidence (7). Hearing impairment varies in severity and type, encompassing conditions like mild, moderate, severely profound, conductive, sensorineural, and mixed hearing loss (8). According to the World Health Organization, 360 million people, or 5.3% of the global population, experience hearing loss (9), a condition that can profoundly affect an individual's life, leading to isolation, dementia, and other serious issues (10).



The body of research in the field of hearing impairment is extensive and has focused on various aspects such as the impact of early identification and intervention, communication strategies, and the advancements in technology like cochlear implants. Flora Nasrallah's 2018 study on school-aged children with unilateral and mild to moderate bilateral hearing loss emphasized language and educational abilities (11), highlighting the necessity for more comprehensive research due to the study's small sample size and limited scope. Teresa Y. C. Ching's 2013 research provided insights into the outcomes of early and late identified children at the age of three (12), demonstrating that children identified earlier showed better results related to hearing aid fitting and the use of cochlear implants.

Birgit May, in 2012, focused on the significant effects of early interventions and the assessment of speech and language development in young children equipped with cochlear implants (13). The study revealed that those who were implanted before the age of 2 exhibited substantial improvements in language and speech development. In a similar vein, Kasai's 2012 study on trilingual severe to profound hearing-impaired Japanese children underscored the importance of early identification and intervention for the development of language (14). This research concluded that early interventions are crucial for better language formulation.

Further exploring the realm of communication skills, Dianne M. Toe and Louise E. Paatsch's 2014 study investigated the communicative abilities of deaf and hard-of-hearing children in a game context (15). It was found that these children used different strategies for information seeking and demonstrated varied response accuracy. Additionally, Mary Pat Moeller's 2000 study identified a positive correlation between early intervention enrollment and language outcomes at 5 years of age (16). This study suggested that children who were enrolled early (by 11 months of age) demonstrated significantly better vocabulary and verbal reasoning skills at 5 years of age compared to those who were enrolled later (17). This body of research collectively emphasizes the critical importance of early identification and intervention in the language development and overall communication skills of children with hearing impairment.

MATERIAL AND METHODS

The study employed a comparative cross-sectional design to examine the communication abilities of hearing-impaired children. Data collection occurred across various settings, including Hamza Foundation School, Rising Sun, Children's Hospital, Nadeem Mukhtar Clinic, Goong Mehal School, and Alam Audiology Clinic. The study was conducted over a period of six months following the approval of the synopsis. The sampling technique utilized was non-probability convenient sampling. The sample comprised 114 hearing-impaired patients, a figure determined using Raosoft sample size calculator (18). The target population for this study was hearing-impaired children found in schools, hospitals, and clinics (19).

The inclusion criteria for the sample selection included both male and female children who were congenitally hearing impaired with bilateral moderate to profound sensorineural hearing impairment. The age range for participation was set between 5 to 14 years, with a hearing age of above one year. Children who were either hearing aid users or had cochlear implants, and those attending regular therapy sessions, were included (20). Conversely, the exclusion criteria encompassed children with unilateral and mild degree hearing impairment and those with any other comorbidities (21).

For data collection, hearing-impaired children were divided into two groups. Group one consisted of children whose hearing was amplified before the age of two, while group two included children whose hearing was amplified after the age of two. Before administering the Communicative Function Checklist, demographic details of the children were obtained from their parents using a demographic form. The Communicative Function Checklist was then administered to both groups, and data were collected by the researcher. This checklist was designed to assess various aspects of communication functions and means. It was complemented by a demographic form that gathered information such as the child's name, age, and the degree of hearing impairment (22).

The data collected were subsequently analyzed using SPSS 22 statistical software. This analysis aimed to elucidate the differences in communication abilities between the two groups of children, based on the age at which their



hearing was amplified. The study's methodology was crafted to ensure a comprehensive understanding of the impact of early versus late hearing amplification on the communicative abilities of hearing-impaired children.

RESULTS

The figure provides a visual summary of a study examining the demographics and device preferences among children with hearing impairments. It reveals that the group is slightly more male-dominated, with males representing 53.3% and females 46.7%. When it comes to the types of hearing loss, moderate and moderately severe hearing losses are the most prevalent, each affecting around 20 individuals. Profound hearing loss is also notable, followed by severe cases, while sensorineural, conductive, neural, and mixed hearing losses are less common. The age distribution chart shows that the majority of the children are in the 0-4 year age bracket, with the numbers gradually decreasing as age increases. Interestingly, the study also looks at the types of devices used by these children, revealing that hearing aids are more commonly used, accounting for 69% of the cases, whereas cochlear implants are used by 31%. This data collectively provides insights into the characteristics of children with hearing impairment in terms of age, gender, type of hearing loss, and the devices used for assistance.

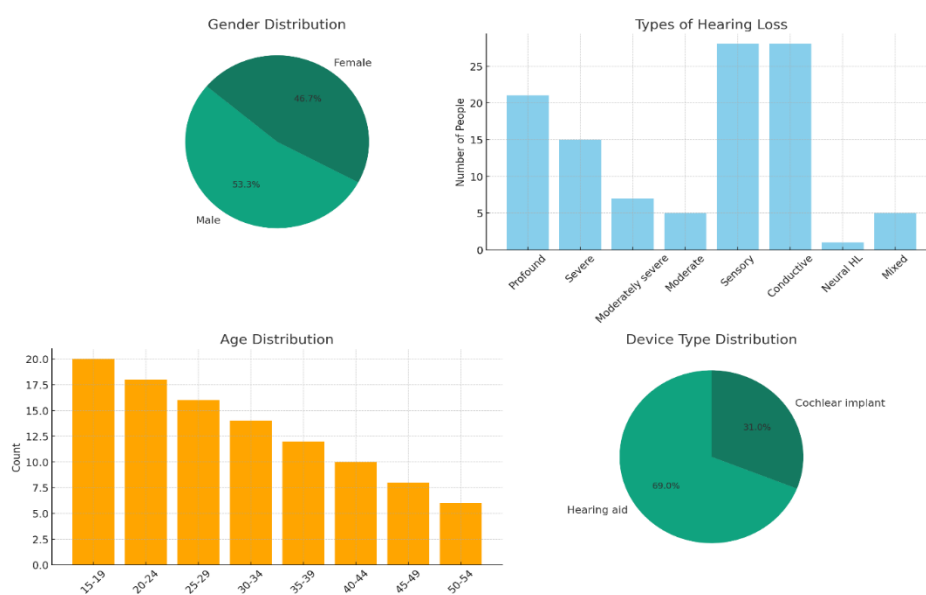


Figure 1 Demographic Summary

is almost identical between the two groups, with early identified at 13.7% and late identified at 14.8%. A gaze shift toward an object is more common in late identified children at 13.0% than in early identified at 9.8%. Notably, head nodding is 23.5% for early identified versus 33.3% for late identified. Facial expressions related to objects are reported at 21.6% for early identified and slightly higher for late identified at 25.9%. Self-injury is relatively low but higher in the late identified group (3.7%) than in the early identified (2.0%). Aggression (5.9% early, 11.1% late), tantrums (3.9% for both groups), crying (11.8% early, 13.0% late), and vocalizing (33.3% early, 31.5% late) show varied incidences between the groups.

Table 1 Behavioural Regulation Responses

Behaviour Category	Early Identified (%)	Late Identified (%)
Object Manipulation	21.6	14.8
Object Pointing	47.1	57.4
Object Showing	13.7	14.8
Object Gaze Shift	9.8	13.0
Object Head Nod	23.5	33.3
Object Facial Expression	21.6	25.9
Object Self Injury	2.0	3.7
Object Aggression	5.9	11.1

In Table 1, detailing Behavioral Regulation Responses, children who were identified early with hearing impairment showed a higher percentage in object manipulation at 21.6% compared to 14.8% for those identified late. For object pointing, the trend reverses with early identified children at 47.1% and late identified at 57.4%. Object showing



Behaviour Category	Early Identified (%)	Late Identified (%)
Object Tantrum	3.9	3.7
Object Crying	11.8	13.0
Object Vocalizing	33.3	31.5

Table 2 focuses on Social Interaction Responses. Physical manipulation in social routines is reported at 11.8% for early identified and 13.0% for late identified children. Pointing during social routines is more common in late identified children at 42.6% compared to 33.3% for those identified early. Showing in social routines is less frequent in early identified children at 9.8% against 18.5% for late identified. A significant difference is observed in gaze shifts during social routines, with early identified children at 13.7% and late identified children at only 1.9%. Head nodding is equally common in both groups, at 31.4% for early identified and 31.5% for late identified. Facial expressions during social routines are similar, with early identified children showing 19.6% and late identified at 20.4%. Aggression and tantrums in social routines are slightly higher in late identified children (5.6% for both) compared to early identified (3.9% for both). Crying during social routines is reported at 9.8% for early identified and 7.4% for late identified. Vocalizing is more common in early identified children at 37.3% as opposed to 25.9% in late identified.

Table 2 Social Interaction Responses

Social Interaction Category	Early Identified (%)	Late Identified (%)
Social Routine Physical Manipulation	11.8	13.0
Social Routine Pointing	33.3	42.6
Social Routine Showing	9.8	18.5
Social Routine Gaze Shift	13.7	1.9
Social Routine Head Nod	31.4	31.5
Social Routine Facial Expression	19.6	20.4
Social Routine Aggression	3.9	5.6
Social Routine Tantrum	3.9	5.6
Social Routine Crying	9.8	7.4
Social Routine Vocalizing	37.3	25.9

Table 3 presents Joint Attention Responses. Physical manipulation when calling is higher in early identified children at 11.8% compared to 5.6% in late identified. Pointing when calling is also more frequent in early identified children at 19.6% versus 11.1% in late identified. Showing during calling is higher in late identified children at 20.4%, in contrast to 13.7% in early identified. Gaze shifts when calling is more common in early identified children at 9.8% compared to 3.7% in late identified.

Table 3 Joint Attention Responses

Joint Attention Category	Early Identified (%)	Late Identified (%)
Calling Physical Manipulation	11.8	5.6
Calling Pointing	19.6	11.1
Calling Showing	13.7	20.4
Calling Gaze Shift	9.8	3.7
Calling Head Nod	13.7	27.8
Calling Facial Expression	17.6	25.9
Calling Self Injury	2.0	7.4
Calling Aggression	5.9	1.9

Head nods during calling are seen more in late identified children at 27.8% against 13.7% in early identified. Facial expressions when calling are reported at 17.6% for early identified and 25.9% for late identified. Self-injury when calling is higher in late identified children at 7.4%, compared to 2.0% in early identified. Aggression when calling is more frequent in early identified children at 5.9%, with late identified children at 1.9%.



DISCUSSION

The discussion section of a study on the communication abilities of early and late identified children with hearing impairment presents a comparison of verbal and preverbal communication as well as the impact of early intervention on language development. The study found no significant variance in the use of language between children identified with hearing impairment by 6 months of age and those identified after this age. However, a notable difference was observed in receptive and expressive language skills, which were better in children identified earlier. These findings align with the results of previous research by Yoshinaga-Itano et al., which also highlighted the benefits of early intervention (23). Children enrolled in language intervention before 11 months demonstrated more advanced vocabulary and verbal reasoning by age 5 compared to those who received intervention later. Early identified children tended to use more verbal communication for communicative functions, including head nods, facial expressions, immediate echo, and creative one-word responses.

The study also reviewed findings from Volden J. and Phillips L., showing that high-functioning children with ASD and typical structural language skills did not perform as well on the Communication Checklist as peers without ASD (24). In contrast, early identified children with hearing impairment in the current study exhibited strong performance on this checklist, particularly in verbal communication. Moreover, the study suggests that late-identified children with hearing loss benefit from early intervention to improve their imitation and word production skills. This is corroborated by the work of De Diego-Lazaro, which emphasized the effectiveness of auditory therapy in enhancing oral expression in children with hearing loss (25). Early and consistent speech interventions were shown to yield significant progress in children's ability to speak words and imitate sounds.

The research underscores that children with hearing impairment who are identified and receive intervention early demonstrate significantly better communication skills than those who are identified later. The primary communication strategies used by early identified children are pointing, facial expression, head nodding, and one-word utterances. Late identified children more frequently resort to preverbal skills, such as head nodding, facial expressions, crying, and vocalizing (26).

However, the study faced limitations due to a low patient ratio in clinical settings, leading to a smaller sample size than anticipated, and the data was only collected from the city of Lahore, which limits the generalizability of the findings. Recommendations from the study include advocating for the promotion of early identification of hearing impairment to enhance communication outcomes and closely observing speech sound development in both early and late identified children with hearing impairment to tailor interventions appropriately.

CONCLUSION

The present study provides compelling evidence that early identification of hearing impairment in children leads to more favorable communication outcomes compared to those identified later. Early identified children tend to develop a richer array of verbal communication methods, such as pointing, facial expression, head nodding, and the use of single words creatively. Conversely, children identified later show a greater reliance on preverbal forms of communication, including facial expressions, crying, and vocalizing.

These findings support the hypothesis that the timeliness of diagnosis and subsequent intervention plays a critical role in the development of communication skills in children with hearing impairments. The results are consistent with previous research, which suggests that early intervention—ideally before 11 months of age—can significantly enhance language development, leading to improved vocabulary and verbal reasoning skills that closely resemble those of hearing peers by the age of five.

The implications of this study underscore the importance of early detection and intervention for children with hearing impairments. Prompt identification, ideally before 11 months, is crucial for improving language development and communication skills, which aligns with those of hearing peers by age five. This calls for integrated efforts to promote newborn hearing screenings, increase parental awareness, and tailor speech therapy to individual needs. The results also advocate for policy changes to implement early hearing detection programs and ensure they are accessible and well-funded. Future research should focus on long-term outcomes and include a broader demographic to validate these findings.



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