Original article

Errors in Hearing Evaluation and the Prescription of Hearing Aids for Infants with Hearing Loss in Khorasan Razavi Province

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ABSTRACT

Background and Aim: Early detection and intervention for hearing loss are vital for optimal language development in infants. However, various errors may arise during hearing evaluations and the prescription of hearing aids. This study aimed to identify these errors in Khorasan Razavi Province, Iran.

Methods: This registry-based study involved 485 infants who did not pass the hearing screening. Data were collected from the "Congenital and Acquired Hearing Loss Cohort Registry in Khorasan Razavi." Infants underwent diagnostic evaluations, with follow-ups lasting up to three years.

Results: Out of 485 infants, only 237 completed the electrophysiologic diagnostic tests; eight were diagnosed with hearing loss (3.37%). Hearing aids were prescribed for five infants, one was a cochlear implant candidate, and three received rehabilitation. A telephone follow-up of 485 cases revealed based on speech and language development checklist that 36 infants (7.42%) exhibited a language/speech delay greater than 6 months. Most important identified errors included loss to follow up (248 out 485, 51.13%), late diagnosis or intervention (189 out 237, 79.74%), not using appropriate test batteries (163 out 237, 68.77%), neglecting tone-burst ABR or ASSR (75 out 237, 31.64%), not employing behavioral tests even for older children (154 out 237, 64.97%), providing intervention without establishing accurate thresholds for severe/profound hearing loss (5 out 5, 100%).

Conclusion: Several errors exist in the evaluation and prescription of hearing aids for infants, especially in cases of severe-to-profound hearing loss. Adhering to standard guidelines and addressing these errors can enhance the quality of hearing assessment and intervention services.

Keywords: Infant, diagnostic errors, Hearing Impaired Rehabilitation, early intervention, hearing aids.

Introduction

Hearing loss in infants is one of the most common congenital sensory disorders, according to the World Health Organization, about 1 to 5 cases of hearing loss occur in every 1,000 live births across various countries [1]. This prevalence rate varies based on the country, the quality of screening programs, and the definitions used for hearing loss [2]. In high-risk infants, such as those admitted to the Neonatal Intensive Care Unit, the incidence increases significantly, reaching rates of 1 to 3% [1]. This relatively high incidence underscores the importance of implementing screening and early intervention programs. Early hearing intervention involves a range of

diagnostic, therapeutic, and rehabilitation measures that commence immediately after the identification of hearing loss in the first few months of life. The aim is to prevent negative impacts on the child's development in language, speech, cognition, and social interactions. The critical period for language and speech development occurs within the first two years of life, and any delay in diagnosis and intervention can lead to further disabilities. Early intervention has been shown to significantly enhance language, speech, and cognitive outcomes [3]. Infants who receive proper intervention prior to six months of age tend to show better expressive and receptive language development, as well as advanced speech skills compared to those who receive intervention later [4, 5]. Hearing evaluations in infants typically begin with screening at birth and continue with objective diagnostic tests, such as Auditory Brainstem Response (ABR), Otoacoustic Emissions (OAE), and Auditory Steady-State Response (ASSR), to establish precise frequency-specific thresholds. This information is critical for prescribing hearing aids, as evidence indicates that effective fitting in infants requires meticulous assessment and adjustment to accommodate their small and developing ear canals [6]. Hearing aid prescriptions are usually carried out using digital technologies, tailored to meet specific goals aimed at optimizing the access to auditory stimuli and preventing sensory deprivation [7]. International guidelines, such as those from the Joint Committee on Infant Hearing (JCIH), emphasize that diagnosis should occur by three months of age, hearing aids should be fitted no later than one month after diagnosis, and rehabilitation interventions should start by six months of age [8]. These measures are essential for optimizing the development of speech, language, and auditory neural pathways during these crucial developmental periods. In more advanced programs, recommendations suggest that diagnostic assessments and therapeutic interventions be conducted as early as two and three months of age [9]. Early intervention such as early hearing aid fitting can expedite the maturation of auditory pathways and improve language and cognitive outcomes. Proper hearing assessments can even lead to fitting hearing aids within the first few months of life [10]. Therefore, accurate hearing assessment and prompt hearing aid prescription are vital components of the early intervention process. When supported by family participation and a multidisciplinary team, these approaches can significantly enhance the developmental outcomes for infants with hearing loss [6].
Some errors can occur during the diagnostic and intervention processes, impacting outcomes. Literature identifies several errors, such as: 1) failure to detect low-frequency hearing loss or structural abnormalities of the inner ear (e.g., Mondini dysplasia) through the ABR test [11], 2) solely relying on factory software algorithms or general fittings of hearing aids without measuring actual sound output [12], 3) using average real ear measurements instead of assessing the infant's own measurements [12], and 4) changes in the infant's external ear as they grow, which can affect real ear measurements and necessitate re-measurements and adjustments [13].
The primary objective of this study is to identify the diagnostic and intervention errors that occur during the hearing assessment and hearing aid fitting process for infants in Khorasan Razavi Province. The findings will help develop local error reduction protocols, design ongoing training programs for audiologists, and enhance the quality of services in hearing screening and early intervention. By identifying and correcting these errors, we aimed to create a better pathway for hearing-impaired infants to achieve favorable outcomes in auditory, language, speech development.

Methods

This study is based on information obtained from the project "Design and Implementation of the Congenital and Acquired Hearing Loss Cohort Registry in Khorasan Razavi," which has the ethical code IR.MUMS.REC.1401.387. This cohort study was conducted from 2023 to 2026 and included various stages such as screening, hearing evaluation, hearing aid prescription, cochlear implantation, and different rehabilitation methods. In this prospective cohort study, infants underwent hearing screening at birth. The screening was conducted using OAE and Automated ABR tests. The results of these screenings were recorded, and follow-ups were conducted until the children reached three years of age. During these follow-ups, all cases related to screening, diagnosis, and interventions for the infants were documented. Infant hearing screening included the results of the first and second stages of screening and various risk factors for hearing loss. In the diagnosis stage, the results of several diagnostic tests, such as tympanometry, OAE, ABR, ASSR, behavioral audiometry, and cortical auditory tests, were examined. The intervention stage involved assessing medical and audiological interventions, including the prescription of hearing aids, cochlear implants, and auditory rehabilitation.
For cases where hearing screening was performed in maternity hospitals and hospitals affiliated with Mashhad University of Medical Sciences, additional information was obtained by contacting the parents of the infants and reviewing the infants' hospital files. Some parents also submitted the results of diagnostic tests through online

channels, which were then examined by an expert audiologist. A speech language therapist also assessed the language and speech development of the infants via the telephone calls to parents. Telephone follow-ups were carried out according to the guidelines set by the Research Ethics Committee of Mashhad University of Medical Sciences [14]. For examining language and speech development, the study employed the Speech and Language Development Checklist for Persian language. This assessment focused on voice production, speech and language abilities, vocabulary, and the quantity and quality of verbal communication.

In rare instances, diagnostic and intervention centers providing services were contacted to gather information about the tests performed and the nature of the interventions administered.

The inclusion criteria were Infants born in Mashhad city, Khorasan Razavi Province, Completion of hearing screening at birth, Availability of diagnostic information, Consent from parents or legal guardians to participate in the study, Unintentional errors due to the clinician's lack of knowledge.

The exclusion criteria were: Insufficient key screening, diagnostic, or interventional data, Failure to contact parents after three attempts at different times and follow-up, Death of the infant or severe illness during the follow-ups period that prevented monitoring of hearing status, language, and speech development. reluctance of parents to continue participating in the study. The information collected was first recorded and reviewed by an audiologist before being evaluated by a second audiologist (author). Initially, all cases were examined independently, and then they were re-examined by the author. Additional focus was given to specific cases based on the children's language and speech evaluation. These included instances where language and speech development was normal despite hearing loss, as well as cases of children with normal hearing but abnormal language and speech development. Errors were identified when a case had been evaluated and classified as an error by both audiologists. The criteria for determining an error were based on the JCIH (2019) Guideline [9] and the American Speech-Language-Hearing Association (ASHA) Guideline for Audiologic Assessment in Children from Birth to 5 Years of Age [15], along with the professional judgment of the audiologists involved. An error was defined as a situation that contradicted the aforementioned guidelines and professional standards. Additionally, errors identified during a face-to-face meeting in 2025 were presented to 20 audiologists from Khorasan Razavi Province who participated in the hearing assessment and hearing aid prescription processes for infants. The findings were discussed and reviewed collectively, with all ethical principles, including confidentiality, observed throughout the process.

It is important to note that the identified issues are not exclusive to any one center; they have been observed across different facilities. Not all centers experience these errors, and many do implement proper and effective practices in their hearing evaluation and intervention processes.

Those who made errors, to best of our knowledge, did not violate any law or guideline issued by the Ministry of Health but rather demonstrated a lack of knowledge regarding modern hearing assessment and the prescription of hearing aids for infants. The centers evaluated included governmental (hospitals and comprehensive rehabilitation centers) and private clinics. Ethical principles were followed when addressing these errors, and efforts were made to inform the relevant centers appropriately. This article also separately received a certificate from the Ethics Committee of Mashhad University of Medical Sciences for not having any deviation from ethical principles (code: 12296784).

Data analysis:

This is descriptive study, presenting information on infants and the observed errors in hearing assessments and hearing aid prescriptions as numerical data and percentages.

Results

In a study of 485 participants conducted over three years, 248 infants (51.13%) did not progress to the diagnostic or intervention stages after being screened. This highlights the low effectiveness of the follow-up system in hearing clinics for ensuring further examinations of infants.

The remaining 237 infants underwent diagnostic electrophysiology tests. Among these 237 infants, 8 were diagnosed with hearing loss. Of those diagnosed, 5 were prescribed hearing aids, 3 out 5 underwent auditory rehabilitation and 1 out 5 was identified as a candidate for cochlear implantation (Figure 1). Out of the 237 infants, 189 (79.74%) were performed hearing diagnosis after the age of three months

Telephone calls were made to the parents of all 485 infants to assess their children's language and speech development. A speech- language therapist evaluated these cases, finding that 36 (7.42%) exhibited a delay of more than 6 months in language development compared to their age group.
Several errors were identified during the hearing assessment and hearing aid prescription process, including: loss to follow-ups (248 out 485, 51.13%), late diagnosis or intervention (189 out 237, 79.74%), inappropriate test battery usage (163 out 237, 68.77%), not employing tone-burst ABR or ASSR (75 out 237, 31.64%), neglecting behavioral tests even for older children (154 out 237, 64.97%), intervening without confirmed thresholds in cases of severe or profound hearing loss (5 out 5, 100%), prescribing hearing aids without accompanying rehabilitation (2 out 5, 40%), not using the Desired Sensation Level (DSL) prescription formula (2 out 5, 40%), foregoing real ear measurements (2 out 5, 40%), errors in cochlear microphonic recordings (2 out 2, 100%), relying on electrophysiological thresholds in cases of auditory neuropathy (2 out 2, 100%), and recording cortical responses when infants were drowsy (1 out 2, 50%).

Discussion
The audiologic centers play a crucial role in providing essential services for infants, including hearing evaluations, hearing aid prescriptions, and hearing rehabilitation, extending their services to smaller communities. Despite these advancements, there are still some issues related to the quality and accuracy of the hearing evaluation and hearing aid prescription. Although no previous study has comprehensively evaluated the wide range of diagnostic and intervention errors identified in the current registry, several published investigations have highlighted specific challenges related to infant hearing assessments and Early Hearing Detection and Intervention (EHDI) programs. Consequently, the findings of this study are discussed in the context of existing literature on issues such as loss to follow-up, delayed diagnosis, pediatric hearing aid fitting, diagnostic protocols, and barriers to effective early intervention.
Approximately half of the infants who failed the initial hearing screening did not return for the recommended diagnostic or intervention services. the present registry did not collect data on the reasons for non-attendance. loss to follow-up should be viewed as a significant challenge within the EHDI pathway rather than an error attributable to individual audiologists or hearing centers. Nonetheless, the high proportion of infants who did not complete the recommended pathway underscores the need for improved tracking systems, family counselling, and coordinated follow-up programs. Infants who did not pass the hearing screening were registered in the Iranian national electronic health information system (SIB). In this study, the term "loss to follow-up" refers to infants who did not complete the diagnostic pathway despite the established follow-up system and should not be interpreted as a lack of follow-up by the research team. This issue reveals a significant flaw in the early intervention process for infant hearing loss, as nearly half of the children who undergo screening do not proceed to diagnosis and intervention during their first three years of life. While some of these children may receive assistance in later years or at school age, such interventions become less effective. The lack of proper follow-up for infants identified within the centralized system poses a substantial challenge for early intervention programs. Unfortunately, it is all too common for children to be prescribed hearing aids or to start rehabilitation programs at an older age, which diminishes the likelihood of successful outcomes. Overall, while progress has undoubtedly been made in the field, addressing these critical issues is essential to improve the hearing evaluation and rehabilitation process for infants with hearing loss. The high dropout rate during the follow-up phase is one of the key findings of this study, illustrating the pressing need for a comprehensive system to monitor these infants and ensure consistent follow-up with diagnostic and intervention processes. Our findings align with previous systematic reviews that show loss to follow-up remains a major challenge for EHDI programs worldwide. Reported barriers include inadequate tracking systems, low parental awareness, socioeconomic constraints, communication difficulties, and limited coordination between screening and diagnostic services [16].
In this study, it was found that approximately half of the infants did not attend the next diagnostic and intervention stages, and around 70% of the remaining cases did not attend their appointments at the scheduled time. This further emphasizes the importance of an effective follow-up system. The incidence of hearing loss in infants is approximately two per thousand live births [17]. The ideal timeline for screening, diagnosis, and intervention is within 1, 2, and 3 months, respectively [9]. In older guidelines, these timelines were set at 1, 3, and 6 months [15, 18, 19]. However, some infants experience delays in diagnostic testing, medical intervention, or the prescription of hearing aids—often for months or even years and despite initial screenings being conducted at one month, the actual diagnosis and intervention frequently occur too late. This delay significantly undermines the effectiveness of early hearing intervention programs, making it challenging to achieve the intended goals. Early hearing

interventions are important for better outcomes [20], as delays can negatively impact the development of language and speech.
According to the JCHI [9] and ASHA [15] protocols, there are specific tests recommended for each age group in hearing assessments for infants and children. However, in our study, most infants in the diagnostic phase underwent only ABR testing, with other electrophysiological tests or behavioral assessments being largely neglected, despite the advanced ages of the children.
For each age range, there is a specific diagnostic protocol and a suitable test battery. This issue is particularly important for infants. Relying on a single test to evaluate the hearing of infants is misguided and undermines the principle of cross-checking. In many cases, an ABR test is employed to assess the hearing of infants. The correct protocol for evaluating the hearing condition of infants involves performing high-frequency tympanometry, OAE, ABR, and ASSR tests. According to JCIH, these evaluations should be complemented by auditory behavioral assessments, such as Visual Reinforcement Audiometry (VRA) at six months and Conditioned Play Audiometry (CPA) at older ages [9]. Relying solely on objective and electrophysiological tests to assess the hearing status of infants is inadequate; behavioral evaluations must also be incorporated. Similar concerns have been highlighted in previous reports on newborn hearing screening programs, where incomplete diagnostic protocols and an overreliance on a single objective test have been recognized as significant sources of diagnostic error. These studies emphasize that strict adherence to standardized diagnostic protocols and the application of the cross-check principle are essential for minimizing false-positive and false-negative diagnoses [21].
Moreover, our findings indicated that the ABR test was predominantly conducted using click stimuli, which do not provide frequency-specific responses. Fortunately, in many cases, Tone-burst evoked ABR testing was also performed, or the ASSR test was employed after the initial ABR test. The click stimulus cannot accurately determine hearing thresholds at single frequencies and is primarily associated with thresholds in the frequency range of 2000 to 4000 Hz [22]. Consequently, audiograms with varying degrees and types of hearing loss at different frequencies can yield the same click threshold. Many clinicians initially prefer the click stimulus due to its ease of use and the distinct characteristic waves it produces. However, using the tone-burst stimulus is essential for accurately estimating frequency-specific hearing thresholds in the ABR test for infants, or for conducting the ASSR test following the ABR test with a click stimulus. The click stimulus in the ABR test should be reserved for assessing auditory dys-synchrony in cases of auditory neuropathy [23].
The study also identified a significant resistance to the use of behavioral assessments for infants, even at older ages, with nearly 65% of cases lacking these assessments. However, some hearing clinics in Khorasan Razavi Province have incorporated behavioral assessments into their testing protocols and routinely conduct them. Behavioral assessment is the gold standard for evaluating the hearing status of infants. The VRA test is applicable for children aged 6 to 24 months, while the CPA test is suitable for those over 24 months [9]. Tympanometry, acoustic reflex evaluations, and speech detection and recognition tests should be included in the assessments for infants older than 6 months [24]. Despite their significance, behavioral hearing tests for infants are currently much less popular among audiologists compared to objective and electrophysiological evaluations, and many physicians also are unfamiliar with these tests. There is a tendency to emphasize the use of objective hearing tests, such as OAE and ABR, over behavioural assessments, even for children several years old.
Notably, in this study, 5 infants (100% of cases) with severe to profound hearing loss did not have accurate estimates of their hearing thresholds obtained through either electrophysiological tests or behavioral assessments, resulting in the prescription of hearing aids without valid threshold data. At first glance, the idea of conducting hearing interventions without establishing hearing thresholds may seem unusual. However, this issue is quite common and affects many infants with severe and profound hearing loss. The absence of hearing thresholds is due to three significant problems: 1) Incorrect Performance of Electrophysiology Tests, 2) Delayed or no Behavioral Hearing Evaluations, and 3) Using of Experimental Methods for Hearing Aid prescriptions.
Typically, hearing thresholds for infants are assessed using physiological and electrophysiological evaluations, such as OAE, ABR, and ASSR. These evaluations are usually complemented by behavioural assessments around six months of age to fully determine the infant's hearing status. Accurate hearing threshold assessments are crucial for prescribing hearing aids, which can only be accurate if the correct hearing thresholds have been established and suitable gain and output levels have been determined using appropriate prescription formulas. If the thresholds are incorrect, all subsequent processes are flawed, potentially leading to further hearing loss.
Unfortunately, current tests used for the electrophysiological evaluation of infants with severe and profound hearing loss are often inadequate. In infants with severe to profound hearing loss, ABR do not produce valid and

reliable responses; thus, nearly all threshold evaluations rely on the ASSR test. The ASSR is a powerful electrophysiological method particularly useful for assessing hearing in infants with severe and profound hearing loss. Its maximum output is about 120 dB (up to 128dB HL in some devices [25]), allowing for accurate hearing threshold assessments up to 115 to 120dB. In cases where the ABR could not determine a threshold, the ASSR can determine residual hearing [25]. This represents a significant improvement over ABR, especially in infant with profound hearing loss, which ABR can only detect hearing loss up to approximately 90 dB. This additional 30dB enables the proper evaluation of infants with severe and profound hearing loss, which is crucial for appropriately prescribing hearing aids without the risk of causing further hearing loss. Regrettably, the ASSR devices currently used in majority of audiology clinics in Khorasan Razavi Province often lack the necessary capabilities, with maximum output levels limited to 90 to 100dB. This limitation undermines the advantages of the ASSR test for severe and profound hearing loss, rendering it virtually indistinguishable from the ABR test.

Performing behavioral tests is a crucial and unavoidable part of the hearing evaluation process for infants, which should ideally occur after six months using the VRA test. Behavioral tests hold significant importance and are considered the gold standard in infants hearing evaluation [9]. In contrast, physiological and electrophysiological evaluations, such as OAE, ABR, and ASSR conducted at birth, are seen as preliminary assessments. Unfortunately, many infants either do not undergo behavioral evaluations or face delays until they are 3 to 5 years old. As a result, the prescription of hearing aids and other interventions for infants with severe and profound hearing loss occurs without proper threshold determination. Some clinicians provided various excuses for not conducting behavioral tests, including: 1) these tests typically have a 10 to 15 dB discrepancy from the actual behavioral threshold, which is also a common issue across all electrophysiological tests. 2)performing behavioral tests is often more difficult, time-consuming, and associated with lower financial gain compared to electrophysiological evaluations. 3)the behavioral testing process may require the collaboration of two audiologists and the active involvement of the parents. 4)There is currently no formal statute requiring audiologists to perform these behavioral tests.

The correct procedure for evaluating and prescribing hearing aids in infants simply includes the following steps: 1) identifying the actual hearing thresholds. 2)prescribing hearing aids based on those actual thresholds using the DSL prescription formula and real ear measurements. 3)properly implementing hearing rehabilitation. It's essential to note that the validity of each step relies on the accuracy of the preceding steps. For instance, if we do not accurately record the real thresholds, we cannot appropriately prescribe the hearing aid based on those thresholds. Without correct hearing aid prescription and verification, the overall rehabilitation process will be ineffective.

Currently, due to the failure to establish accurate thresholds for infants with severe and profound hearing loss, none of these crucial steps are effectively executed in this population. Clinicians often resort to various experimental methods for prescription of hearing aids in the absence of hearing thresholds. These methods rely on assessing the infant's aided responses to sound and monitoring language and speech development over time. Some experimental methods are more cautious, opting for lower gain adjustments, while others apply maximum gain. Regrettably, these approaches are flawed and can result in the loss of critical time for language and speech development, as well as significant damage to any residual hearing in infants. The major issue is that, these methods may yield successful outcomes for a small minority, and used as justifications of these methods.

Of the 8 infants diagnosed with hearing loss in this study, 5 had received hearing aids, but only 3 had received hearing rehabilitation. Hearing aids and hearing rehabilitation constitute a single treatment package for infants with sensorineural hearing loss [26]. Simply prescribing hearing aids without accompanying rehabilitation exercises is insufficient for the development of language and speech in infants. It has been noted that the use of more advanced hearing aids does not necessarily result in greater benefits; rather, a combination of various rehabilitation factors is crucial for achieving successful outcomes [27].

This study involved follow-up of infants who had received hearing aids, revealing that in two cases, the DSL prescription formula had not been applied. The standard prescription formula for infants with hearing loss is the DSL prescription formula [9, 28]. The NAL prescription formula, on the other hand, is intended for adults. Also, using prescription formulas developed by different hearing aid manufacturers lacks the necessary scientific validity.

In 2 of the 5 cases where hearing aids were prescribed, Real Ear measurements were not utilized. A critical step in fitting hearing aids for infants is conducting a real ear measurements[9]. This measurement enhances the accuracy of hearing aid prescriptions even for adults [29]. Using the average of real ear measurements instead of the infant's own evaluation can result in the hearing aid prescribed for the infant not meeting the prescribed goals, which can lead to decreased speech intelligibility [12]. These observations align with the findings of McCreery et al, who reported that pediatric hearing aid fittings often deviate from recommended clinical protocols, particularly concerning verification procedures and the use of individualized real-ear measurements. Their findings further underscore the importance of evidence-based fitting protocols to optimize amplification outcomes for infants and young children [12].

We encountered two cases of suspected auditory neuropathy, where Cochlear Microphonic testing was performed. However, in these cases, the recorded waves lacked latency time and began at 0 ms. Using cochlear microphonic can aid in diagnosing auditory neuropathy [9]. However, there are instances where electrical noises are incorrectly identified as cochlear microphonic. They produce a response with the opposite polarity even when the polarity of the stimulus is reversed [30]. One effective way to differentiate real Cochlear Microphonic from noise is that a true auditory response exhibits latency, while noise begins at 0ms without latency. For the two cases of suspected auditory neuropathy, only electrophysiological assessments were conducted to evaluate hearing thresholds, and behavioral tests were not performed, even as the infants grew older. In situations involving nervous system lesions or auditory neuropathy, the thresholds obtained from electrophysiological tests, such as ABR, ASSR, and even cortical tests, should be interpreted with caution. It is essential to conduct behavioral tests to confirm these thresholds. Electrophysiological results should not serve as the sole basis for hearing aid prescriptions or rehabilitation, especially for this population.

According to the JCIH 2019 guideline [9], Cortical responses can be used to assess hearing thresholds in infants suspected of having auditory neuropathy (in the absence of ABR responses). In one of the suspected auditory neuropathy cases, the test was conducted while the infant was drowsy, which adversely affected the cortical responses. The accurate performance of cortical Responses relies on the child's wakefulness; recording the test while the child is sleepy can lead to incorrect results. Therefore, it is vital to ensure that the child is completely alert during testing to obtain valid responses. In Iran, routine clinical evaluations of infants follow the national guidelines titled "Principles, Standards, and Guidelines for the Provision of Ear and Hearing Prevention and Care Services for Infants and Children within the Primary Health Care System." These guidelines indicate that the diagnostic pathway for suspected auditory neuropathy is primarily based on OAE and ABR.

Collectively, the findings of this study indicate that most identified errors can be prevented through consistent implementation of established clinical practice guidelines. According to the JCIH 2019 Position Statement and ASHA pediatric audiology guidelines, audiologists should adhere to age-specific diagnostic protocols that incorporate cross-check principles. This includes high-frequency tympanometry, OAE, frequency-specific tone-burst ABR, and/or ASSR, followed by age-appropriate behavioral audiometry (VRA or CPA). Diagnostic and intervention timelines should align with Early Hearing Detection and Intervention benchmarks to minimize delays in language development. Hearing aid fittings should only occur after obtaining reliable frequency-specific hearing thresholds, and they should routinely include the DSL prescription method along with real-ear verification to ensure appropriate amplification. Additionally, structured follow-up systems, continuous professional education, and multidisciplinary family-centered intervention programs are crucial for reducing diagnostic and management errors. Implementing these recommendations may significantly improve the quality, consistency, and safety of infant hearing assessments and early intervention services.

Overall, despite variations in healthcare systems and study designs, our findings align with previous reports indicating that inadequate follow-up, deviations from recommended diagnostic protocols, and incomplete hearing-aid verification continue to be significant challenges in pediatric audiology. However, in contrast to previous studies that focused on isolated aspects of EHDI programs, our registry provides a comprehensive overview by documenting multiple diagnostic and intervention errors across the entire continuum of infant hearing assessment, hearing-aid fitting, and early rehabilitation. This approach enables a more thorough evaluation of clinical practice. Since this article is based on registry data, and there are numerous cases of parents not returning for follow-up evaluations, it is challenging to statistically determine the incidence of each diagnostic error. Additionally, there is a potential for recall bias.

Conclusions

The process of evaluating and prescribing hearing aids for infants is complex and requires precision. This study highlights various errors in the processes of hearing assessment and hearing aid prescription for infants. By identifying these issues, we hope to help to formulate practical solutions. Establishing a centralized integrated system for tracking infants may help alleviate the challenges associated with monitoring the stages of diagnosis and intervention.

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Figure 1. Flowchart of infants evaluated in the study