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Audiological Services Available for Children with Hearing Impairment in Special Schools and Institutes of Lahore

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ABSTRACT
This study investigated the availability and adequacy of audiological services for children with hearing impairment in special schools and institutes of Lahore. A quantitative descriptive design was employed, and a non-probability convenience sampling technique was used to select 32 audiologists working in these institutions. Data were collected through a structured questionnaire assessing personnel, equipment, hearing assessment, monitoring, follow-up, hearing aid services, parental support, and institutional commitment. Results indicated that basic assessments such as pure tone audiometry were widely available (75.0%), whereas advanced diagnostics like OAE (18.8%) and ABR (12.5%) were limited. Regular hearing monitoring (46.9%) and parental counselling (43.8%) were inconsistently provided. Hearing aid services, assistive devices, and ear mould preparation were inadequately supported, while institutional commitment and budgeting were insufficient. One-way ANOVA revealed significant differences in service provision across schools, hospitals, and clinics. The study highlights critical gaps in personnel, equipment, parental involvement, and administrative support, emphasizing the need to strengthen audiological services to enhance communication and educational outcomes.

Keywords: *Audiological Services, Hearing Impairment, Special Schools, Hearing Assessment, Hearing Aids, Parental Support, Lahore.*

Introduction

Communication is central to children's learning, social participation, and emotional wellbeing. Hearing plays a critical role in acquiring spoken language and in accessing classroom instruction, particularly during early childhood when foundational speech, vocabulary, and phonological skills develop. When hearing loss is not identified and managed on time, children may experience delays in speech and language development, reduced classroom participation, and long-term academic disadvantages (World Health Organization [WHO], 2016; Shojaei et al., 2016). Globally, hearing loss is a major public

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health and education concern. WHO estimates that more than 5% of the world's population requires rehabilitation for disabling hearing loss, including millions of children, and the burden is projected to increase over time (WHO, 2025). These patterns highlight why school and community-based hearing services are not only clinical needs but also educational necessities.

In educational settings, hearing impairment is commonly understood as a hearing condition, whether permanent or fluctuating, that adversely affects a child's educational performance (Individuals with Disabilities Education Act [IDEA], 2017). This definition is important because it links hearing loss directly with learning outcomes and the need for supportive services within schools. For children with hearing impairment, the barriers are rarely limited to reduced auditory sensitivity alone. Hearing loss can limit access to teacher instruction, peer interaction, classroom discussions, and incidental learning, which is a major pathway through which children pick up language, concepts, and social rules. Over time, these barriers can contribute to academic underachievement, social withdrawal, and reduced self-confidence. In addition, families often experience stress as they navigate diagnosis, treatment, and educational placement, especially in contexts where services are limited or unevenly distributed (Mumtaz et al., 1995).

Early identification and intervention are consistently associated with better language and communication outcomes. Evidence suggests that identifying hearing loss and initiating intervention in the first months of life supports stronger language development compared to later identification (Shojaei et al., 2016). UNICEF also emphasizes that early detection improves children's chances for language acquisition and participation in daily life, particularly when combined with timely therapy and appropriate supports (UNICEF, 2024). In practical terms, early intervention is not a single action, but a coordinated pathway that includes screening, diagnostic assessment, amplification or assistive technology where appropriate, family counselling, and educational planning. However, even when early detection occurs, children still require ongoing monitoring and support in school settings to ensure that devices work properly, listening environments are optimized, and educational access is maintained.

Audiology, as a clinical discipline, focuses on the assessment, prevention, and management of hearing and related auditory disorders. Audiologists are trained to identify hearing difficulties, conduct diagnostic evaluations, recommend and fit amplification or assistive listening devices, and provide rehabilitation support that improves functional communication (American Speech-Language-Hearing Association [ASHA], n.d.). Within special education institutes and schools, audiological services may include periodic hearing assessments, hearing aid checks, earmould services, counselling for students and parents, and coordination with teachers to support classroom listening. These services are particularly relevant in schools serving children with hearing impairment because educational progress often depends on consistent access to sound, clear speech signals, and appropriate listening conditions. Without such supports, even children who have been fitted with hearing aids may struggle due to device malfunction, poor fitting, inadequate maintenance, or high classroom noise levels.

In Lahore, a major metropolitan and educational hub, special education institutes and schools serve diverse groups of children with hearing impairment. Yet the availability and appropriateness of audiological services can vary across settings, depending on staffing, equipment, institutional funding, and coordination between clinical and educational teams. A school may have some audiological supports, but still lack essential components such as sound-treated testing space, routine diagnostic tools, or repair and maintenance services. In such circumstances, children may be assessed irregularly, devices may remain

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unrepaired, and families may receive limited guidance, ultimately affecting learning continuity. Therefore, examining the types of audiological services available in schools and assessing how appropriate these services are for children's needs becomes an important area of inquiry, especially for improving educational access, reducing communication barriers, and strengthening rehabilitation pathways.

This study focuses on audiological services available for persons with hearing impairment in Lahore, with particular attention to services provided in special education schools and institutes. By identifying what services exist and evaluating their appropriateness, the study aims to generate evidence that can guide administrators, policymakers, and service providers in improving school-based hearing support. Strengthening audiological services in educational settings aligns with broader public health and inclusion goals because it supports children's communication rights, participation, and educational attainment while reducing preventable developmental and academic delays associated with unmanaged hearing loss (WHO, 2016; WHO, 2025).

Objectives of the Study

1- To identify the types of audiological services available for children with hearing impairment in special schools and institutes of Lahore.

2- To examine the availability of audiological personnel, equipment, and facilities in these institutions.

3- To assess the appropriateness and adequacy of existing audiological services in meeting the educational and rehabilitative needs of children with hearing impairment.

4- To explore the gaps and challenges in the provision of audiological services in special schools and institutes of Lahore.

Literature Review

Audiological services are an essential component of educational support for children with hearing impairment because hearing access directly influences language development, classroom participation, and academic performance. The literature indicates that hearing loss in childhood can affect speech and language acquisition, literacy development, social interaction, and psychosocial wellbeing, particularly when identification and intervention are delayed (World Health Organization [WHO], 2016). Globally, the burden of hearing loss is substantial and increasing, and WHO highlights the need for integrated ear and hearing care, including rehabilitation and accessible services across community and school settings (WHO, 2025). Within this context, special schools and institutes have a critical role in ensuring that children with hearing impairment receive systematic audiological assessment, appropriate amplification support, monitoring, and coordinated educational planning.

Hearing impairment is typically defined in relation to its educational impact. Under the Individuals with Disabilities Education Act, hearing impairment refers to an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance and is not included under deafness (Individuals with Disabilities Education Act [IDEA], 2017). This definition positions hearing impairment as an educational need that requires school-based services and adaptations. Hearing loss may be conductive, sensorineural, or mixed, and its degree and configuration determine the type of intervention required. WHO emphasizes that many causes of childhood hearing loss are preventable, but when hearing loss is unavoidable, early identification and intervention are necessary to support a child's development and functional outcomes (WHO, 2016; WHO, 2025). This background is directly linked to the present study's objectives, which focus on identifying audiological services, examining service capacity, assessing appropriateness,

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and highlighting gaps in special schools and institutes in Lahore.

Types of audiological services available for children with hearing impairment

The literature generally categorizes audiological services for children into screening, diagnostic assessment, intervention and amplification support, and follow-up monitoring. Screening commonly includes Otoacoustic Emissions (OAE) and automated Auditory Brainstem Response (ABR), which are widely used for newborn and early childhood screening due to their objective nature (Joint Committee on Infant Hearing [JCIH], 2019). In educational contexts, periodic hearing screening and referral pathways are important because some children develop progressive or delayed-onset hearing loss after infancy (JCIH, 2019).

Diagnostic assessment typically involves a combination of behavioral, physiological, and electrophysiological measures. ASHA's pediatric assessment guidelines emphasize that final determination of hearing loss should be based on integrated results from multiple procedures rather than a single test (American Speech-Language-Hearing Association [ASHA], 2004). Similarly, professional clinical guidance highlights the importance of combining acoustic immittance (including tympanometry), OAEs, ABR, and age-appropriate behavioral audiometry to confirm type and degree of hearing loss (American Academy of Audiology, 2020). The American Academy of Pediatrics also recognizes that objective tests such as OAEs and ABR play a key role, especially in infants and young children, while middle-ear assessment is important to interpret outcomes accurately (American Academy of Pediatrics, 2009).

Intervention-related services include hearing aid selection and fitting, earmould services, assistive listening technology, and cochlear implant referral where appropriate. WHO notes that early identification must be paired with timely interventions, including amplification and rehabilitation, to reduce long-term impacts on language and learning (WHO, 2016). In special schools, audiological services also include classroom-focused recommendations, such as improving listening environments, advising teachers on communication strategies, and supporting individualized educational planning for children with hearing impairment (WHO, 2021). These service types form a useful benchmark for identifying what is available in special schools and institutes in Lahore.

Availability of personnel, equipment, and facilities

The literature consistently highlights that the availability of qualified personnel is a defining indicator of service quality. Audiologists are responsible for diagnostic evaluation, interpretation, intervention planning, device fitting, and counselling, while technicians may support testing, device maintenance, and routine procedures under supervision (ASHA, 2004). JCIH (2019) emphasizes the need for coordinated systems and skilled workforce capacity to ensure timely screening, diagnosis, and intervention. In educational settings, collaboration between audiologists, teachers, speech-language professionals, and families is necessary to ensure that audiological recommendations translate into classroom access and functional communication outcomes (JCIH, 2019; WHO, 2021).

In terms of facilities, the literature identifies sound-treated rooms, appropriate seating and testing arrangements, and safe equipment storage as basic requirements for accurate assessment and service delivery. Equipment standards commonly include screening and diagnostic audiometers, tympanometers, OAE and ABR systems, calibrated headphones or insert earphones, and hearing aid verification and programming tools (American Academy of Audiology, 2020). WHO also emphasizes that strengthening ear and hearing care requires access to technology, trained providers, and service delivery systems that can reach children in places where they learn and live, including schools (WHO, 2025). Within

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special schools, the presence of hearing aid maintenance and minor repair support is particularly important because children's daily learning can be disrupted when devices malfunction or are poorly maintained (WHO, 2016). This literature supports the present study's focus on examining whether special schools and institutes have the necessary staff and infrastructure to deliver meaningful audiological services.

Appropriateness and adequacy of existing services

Appropriateness refers to whether services match children's developmental, clinical, and educational needs, while adequacy refers to whether services are sufficient in coverage, quality, and frequency. Evidence from early hearing detection and intervention literature shows that earlier and well-coordinated services are associated with stronger language and communication outcomes. JCIH recommends timely milestones for screening, diagnosis, and intervention and stresses that service systems must ensure continuous access and follow-up rather than one-time testing (JCIH, 2019). WHO similarly notes that unaddressed hearing loss can negatively affect language, literacy, social skills, and educational attainment, and that appropriate rehabilitation services can reduce these impacts (WHO, 2016).

Adequacy in school-based audiology also includes regular monitoring and documentation. Children using hearing aids require routine checks of device function, earmould fit, and listening performance, alongside periodic reassessment of hearing thresholds. Professional guidance indicates that discrepancies across behavioral and physiological tests should be investigated, and assessments should be repeated when needed to maintain accurate management decisions (American Academy of Audiology, 2020; ASHA, 2004). In addition, counselling and family engagement are part of appropriateness because families need guidance on device use, safety, and communication strategies at home, and consistent communication between school and parents supports better continuity of care (JCIH, 2019; WHO, 2021). Therefore, when evaluating appropriateness in Lahore's special schools, the literature suggests attention to whether services are comprehensive, coordinated, and sustained over time.

Gaps and challenges in service provision

The literature identifies several recurring challenges in audiological service provision, especially in low- and middle-income contexts: shortage of trained professionals, limited diagnostic technology, inadequate referral systems, inconsistent follow-up, and financial barriers to amplification and rehabilitation services (WHO, 2016; WHO, 2021). Even when schools provide some services, gaps may appear in advanced diagnostics (such as ABR availability), hearing aid verification tools, sound-treated environments, and maintenance or repair support. WHO emphasizes that hearing care requires system-level strengthening through workforce development, service integration, and rehabilitation access so that children are not excluded from learning due to preventable service limitations (WHO, 2025).

In special education settings, another challenge noted in guidance is translating clinical results into effective educational accommodations. If audiological findings are not shared clearly with teachers and families, or if classrooms are not supported to reduce noise and improve access, the educational benefit of testing and devices may remain limited (WHO, 2021). JCIH also highlights that monitoring and quality assurance are necessary to reduce loss-to-follow-up and ensure that children who are identified actually receive ongoing services and early intervention (JCIH, 2019). These documented challenges justify the present study's emphasis on identifying service gaps and exploring barriers to adequate audiological support in Lahore's special schools and institutes.

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METHODOLOGY

This study adopted a quantitative and descriptive research design to examine the availability of audiological facilities in institutions serving individuals with hearing impairment in Lahore, as reported by audiologists. The target population consisted of audiologists working in schools and institutes for persons with hearing impairment in Lahore city. A non-probability convenience sampling technique was used to select 32 audiologists who were accessible and willing to participate in the study.

A structured questionnaire was developed by the researchers based on a comprehensive review of relevant literature and under the supervision of the research supervisor. The instrument was designed to assess the presence, adequacy, and utilization of audiological facilities within hearing-impaired institutions. The questionnaire comprised 18 closed-ended items measured on a three-point scale: 1 = Yes, 2 = No, and 3 = To some extent. The items were framed in the local language to ensure clarity and better understanding among respondents.

Data collection was carried out through personal visits to the selected institutions. The researchers distributed the questionnaires directly to the 32 audiologists and clearly explained the purpose of the study to ensure informed participation. Participation was voluntary, and informed consent was obtained prior to data collection. The collected data were coded and entered for analysis using statistical software. Descriptive statistical techniques, including frequencies and percentages, were applied to analyze the responses. The results were presented in tabular form to provide a clear representation of the availability of audiological facilities. Ethical principles were strictly observed, ensuring confidentiality, anonymity, and the voluntary nature of participation throughout the research process.

Table 1 Demographic Characteristics of Audiologists (N = 32)

Variable	Category	n	%
Gender	Male	21	65.6
	Female	11	34.4
Age (Years)	25–35	20	62.5
	36–45	8	25.0
	46 and above	4	12.5
Qualification	BS Audiometry	10	31.3
	MA Special Education with Audiometry Diploma	12	37.5
	M.Phil. Special Education with Audiometry Diploma	5	15.6
	MBBS	1	3.1
	M.Sc. Psychology with Audiometry Diploma	1	3.1
	Audiometry Technician	3	9.4
Work Setting	School	18	56.3
	Hospital	7	21.9
	Clinic	7	21.9
Experience (Years)	0–5	24	75.0
	6–10	4	12.5
	11–15	3	9.4

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Variable	Category	n	%
	16–20	1	3.1

Table 1 presents the demographic characteristics of the audiologists (N = 32) who participated in the study on audiological services available for children with hearing impairment in special schools and institutes of Lahore. The majority of respondents were male (65.6%), while females constituted 34.4% of the sample. Most audiologists were in the 25–35 years age group (62.5%), followed by 36–45 years (25.0%) and 46 years and above (12.5%), indicating a predominantly young professional workforce.

Regarding qualifications, the largest proportion held an MA in Special Education with an Audiometry Diploma (37.5%), followed by BS Audiometry (31.3%). Smaller groups included M.Phil. Special Education with an Audiometry Diploma (15.6%), Audiometry Technicians (9.4%), and a few with MBBS (3.1%) or an MSc in Psychology with an Audiometry Diploma (3.1%). In terms of work setting, more than half of the audiologists were working in schools (56.3%), while equal proportions were employed in hospitals (21.9%) and clinics (21.9%). With respect to professional experience, most participants had 0–5 years of experience (75.0%), followed by 6–10 years (12.5%), 11–15 years (9.4%), and 16–20 years (3.1%), showing that the sample largely consisted of early-career practitioners.

Table 2 Descriptive Statistics for Audiological Service Facilities (N = 32)

Items	Yes n (%)	No n (%)
Audiologist appointed in school	16 (50.0)	16 (50.0)
Sound-treated room available	14 (43.8)	18 (56.2)
Clinical audiometer available	19 (59.4)	13 (40.6)
Tympanometer available	12 (37.5)	20 (62.5)
OAE testing facility available	6 (18.8)	26 (81.2)
ABR testing facility available	4 (12.5)	28 (87.5)
Hearing aid fitting service available	11 (34.4)	21 (65.6)
Hearing aid repair service available	8 (25.0)	24 (75.0)
Ear mould preparation facility available	13 (40.6)	19 (59.4)
Regular hearing monitoring conducted	15 (46.9)	17 (53.1)
Parental counselling sessions arranged	14 (43.8)	18 (56.2)
Budget allocated for audiological services	7 (21.9)	25 (78.1)

Table 2 shows the availability of audiological service facilities across the surveyed institutions (N = 32). Only half of the institutions reported having an appointed audiologist (50%). Basic diagnostic resources such as a clinical audiometer were available in a majority of settings (59.4%), while more specialized facilities were limited, including tympanometers (37.5%), OAE testing (18.8%), and ABR testing (12.5%). Support services were also insufficient, with hearing aid fitting (34.4%), repair (25.0%), and ear mould preparation (40.6%) available in less than half of the institutions. Regular hearing monitoring (46.9%) and parental counselling sessions (43.8%) were also not consistently

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provided. Notably, only 21.9% of institutions reported having a dedicated budget for audiological services, indicating overall gaps in advanced facilities and financial support.

Table 3 Descriptive Statistics for Hearing Assessment Services (N = 32)

Items	**Yes n (%)**	**No n (%)**
Hearing screening conducted at admission	18 (56.3)	14 (43.7)
Pure tone audiometry conducted in school	24 (75.0)	8 (25.0)
Tympanometry testing conducted	14 (43.8)	18 (56.2)
OAE testing conducted	6 (18.8)	26 (81.2)
ABR testing conducted	4 (12.5)	28 (87.5)

Table 3 presents the status of hearing assessment services in the surveyed institutions (N = 32). More than half of the institutions reported conducting hearing screening at the time of admission (56.3%). Pure tone audiometry was the most commonly available assessment procedure, conducted in 75.0% of the settings. In contrast, more advanced diagnostic tests were less frequently used, with tympanometry conducted in 43.8% of institutions, OAE testing in 18.8%, and ABR testing in only 12.5%. Overall, the findings indicate that while basic hearing assessment is relatively common, access to advanced assessment procedures remains limited.

Table 4 Descriptive Statistics for Hearing Monitoring and Follow-Up Services (N = 32)

Items	**Yes n (%)**	**No n (%)**
Students' hearing checked monthly	15 (46.9)	17 (53.1)
Annual hearing assessment conducted	27 (84.4)	5 (15.6)
Hearing test reports properly maintained	20 (62.5)	12 (37.5)
Hearing reports shared with parents	14 (43.8)	18 (56.2)
Follow-up assessment conducted when change is suspected	18 (56.3)	14 (43.7)

Table 4 presents the descriptive statistics for hearing monitoring and follow-up services in the surveyed institutions (N = 32). The results show that fewer than half of the institutions conduct monthly hearing checks (46.9%), while a strong majority carry out annual hearing assessments (84.4%). Proper maintenance of hearing test reports is reported by 62.5% of institutions. However, fewer institutions share hearing reports with parents (43.8%). Follow-up assessments when a change in hearing is suspected are conducted in 56.3% of cases. These findings suggest that although annual assessments are widely practiced, regular monitoring and parent reporting are less consistently implemented.

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Table 5 Descriptive Statistics for Hearing Aid and Assistive Device Services (N = 32)

Items	Yes n (%)	No n (%)
Hearing aid fitting service available	11 (34.4)	21 (65.6)
Hearing aids checked regularly by staff	15 (46.9)	17 (53.1)
Hearing aid repair service available	8 (25.0)	24 (75.0)
Ear mould preparation facility available	13 (40.6)	19 (59.4)
Assistive listening devices (e.g., FM systems) available	6 (18.8)	26 (81.2)

Table 5 presents the descriptive statistics for hearing aid and assistive device services in the surveyed institutions (N = 32). The availability of hearing aid fitting services was reported by only 34.4% of institutions, while regular checking of hearing aids by staff was slightly more common (46.9%). Hearing aid repair services were limited, available in just 25.0% of settings. Ear mould preparation facilities were reported by 40.6% of institutions. Assistive listening devices such as FM systems were the least available resource, present in only 18.8% of institutions. Overall, the results indicate limited provision of hearing aid and assistive device support services across institutions.

Table 6 Descriptive Statistics for Parental Support and Counselling Services (N = 32)

Items	Yes n (%)	No n (%)
Parents informed about child's hearing condition	18 (56.3)	14 (43.7)
Counselling sessions arranged for parents	14 (43.8)	18 (56.2)
Guidance provided on care and maintenance of hearing aids	17 (53.1)	15 (46.9)
Regular meetings held to discuss audiological progress	13 (40.6)	19 (59.4)
Parents involved in decision-making about hearing interventions	12 (37.5)	20 (62.5)

Table 6 presents the descriptive statistics for parental support and counselling services in the participating institutions (N = 32). Just over half of the institutions reported informing parents about their child's hearing condition (56.3%) and providing guidance on the care and maintenance of hearing aids (53.1%). However, formal counselling sessions for parents were arranged in fewer institutions (43.8%). Regular meetings to discuss audiological progress were reported by 40.6% of institutions, while only 37.5% involved parents in decision-making regarding hearing interventions. Overall, the findings suggest that parental support and structured counselling services are available in some institutions but are not consistently implemented.

Table 7 Descriptive Statistics for Institutional Support and Administrative Commitment (N = 32)

Items	Yes n (%)	No n (%)
School administration supports audiological services	19 (59.4)	13 (40.6)

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Items	Yes n (%)	No n (%)
Adequate budget allocated for audiological services	7 (21.9)	25 (78.1)
Staff trained to handle children with hearing impairment	16 (50.0)	16 (50.0)
Professional development workshops conducted regularly	10 (31.3)	22 (68.7)
Overall audiological services meet students' needs	12 (37.5)	20 (62.5)

Table 7 presents the descriptive statistics for institutional support and administrative commitment toward audiological services (N = 32). A majority of respondents reported that school administration supports audiological services (59.4%). However, only a small proportion of institutions indicated that an adequate budget is allocated for these services (21.9%). Half of the institutions reported having staff trained to handle children with hearing impairment (50.0%). Regular professional development workshops were conducted in only 31.3% of institutions. Furthermore, just 37.5% of respondents believed that the overall audiological services sufficiently meet students' needs. Overall, the findings point to moderate administrative support but notable gaps in funding, training, and service adequacy.

Table 8 One-Way ANOVA Results of Audiological Services Based on Working Setting (N = 32)

Factors	Sum of Squares	Df	Mean Square	F	Sig.
Audiological Personnel Availability					
Between Groups	18.742	2	9.371	5.94	.007
Within Groups	45.689	29	1.576		
Total	64.431	31			
Hearing Assessment Services					
Between Groups	26.318	2	13.159	6.81	.004
Within Groups	56.071	29	1.934		
Total	82.389	31			
Hearing Monitoring & Follow-Up					
Between Groups	12.506	2	6.253	4.12	.026
Within Groups	44.005	29	1.517		
Total	56.511	31			
Audiological Equipment & Facilities					
Between Groups	31.445	2	15.723	7.35	.002
Within Groups	61.996	29	2.138		
Total	93.441	31			
Hearing Aid & Assistive Device Services					
Between Groups	34.271	2	17.136	8.04	.001

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Factors	Sum of Squares	Df	Mean Square	F	Sig.
Within Groups	61.820	29	2.132		
Total	96.091	31			
Institutional Support & Administrative Commitment					
Between Groups	41.982	2	20.991	9.27	.001
Within Groups	65.667	29	2.264		
Total	107.649	31			

Table 8 presents the one-way ANOVA results comparing audiological services across different working settings (school, hospital, and clinic) (N = 32). The analysis shows statistically significant differences among working settings across all major service domains. Significant differences were found for audiological personnel availability (F = 5.94, p = .007), hearing assessment services (F = 6.81, p = .004), and hearing monitoring and follow-up services (F = 4.12, p = .026). Similarly, significant variations were observed in audiological equipment and facilities (F = 7.35, p = .002), hearing aid and assistive device services (F = 8.04, p = .001), and institutional support and administrative commitment (F = 9.27, p = .001). Since all p-values are below .05, the findings indicate that the level and quality of audiological services differ significantly depending on the working setting.

Results and Discussion

The findings of this study indicate that audiological services for children with hearing impairment in special schools and institutes of Lahore are present but remain limited in scope and consistency. Analysis of the demographic characteristics of audiologists revealed that most participants were young professionals aged 25–35 years, predominantly male (65.6%), and held qualifications such as an MA in Special Education with an Audiometry Diploma (37.5%) or BS in Audiometry (31.3%). A majority had less than five years of professional experience, reflecting a workforce that is relatively early in their career. This demographic pattern suggests that the capacity to deliver comprehensive audiological services may be constrained by limited experience and professional development opportunities, which is consistent with literature emphasizing the impact of workforce capacity on the quality of school-based hearing services (WHO, 2016; ASHA, 2004).

Regarding service availability, the study found that only 50% of institutions had an appointed audiologist. Basic diagnostic equipment such as clinical audiometers was available in 59.4% of settings, but specialized facilities such as tympanometers (37.5%), OAE testing (18.8%), and ABR testing (12.5%) were infrequently accessible. Support services including hearing aid fitting (34.4%), repair (25.0%), and ear mould preparation (40.6%) were similarly limited. Regular hearing monitoring was conducted in fewer than half of institutions (46.9%), and parental counselling sessions were available in 43.8% of cases. Only 21.9% of institutions had a dedicated budget for audiological services. These findings indicate substantial gaps in infrastructure, personnel, and financial support, echoing prior studies that highlight the importance of adequately resourced audiology services for functional communication and educational access (WHO, 2021; JCIH, 2019).

Assessment services were largely limited to basic procedures. Hearing screening at admission was reported by 56.3% of institutions, while pure tone audiometry was widely available (75.0%). Advanced diagnostic tests, however, such as tympanometry (43.8%),

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OAE (18.8%), and ABR (12.5%), were rarely conducted. The limited availability of advanced assessments may hinder early and accurate identification of hearing loss, consistent with findings by the American Academy of Pediatrics (2009) and ASHA (2004), who emphasize that early and precise diagnostics are essential to inform timely intervention and reduce long-term developmental delays.

Hearing monitoring and follow-up services also demonstrated variability. While annual hearing assessments were conducted in the majority of institutions (84.4%), fewer schools performed monthly hearing checks (46.9%). Proper maintenance of hearing reports was recorded in 62.5% of institutions, but sharing of reports with parents occurred in only 43.8% of cases, and follow-up assessments when hearing changes were suspected were carried out in 56.3% of institutions. These findings suggest that ongoing monitoring and communication with families are inconsistent, which may compromise early identification of hearing deterioration and timely management. Research has shown that routine monitoring and parent engagement are critical for optimizing outcomes, as they ensure devices are functional and interventions are reinforced in daily contexts (JCIH, 2019; WHO, 2021).

Provision of hearing aid and assistive device services was limited. Hearing aid fitting services were available in only 34.4% of institutions, with regular device checks slightly more common (46.9%). Repair services were provided in 25.0% of cases, and assistive listening devices such as FM systems were rare (18.8%). The limited availability of amplification and assistive technology is concerning because children with unmanaged or poorly supported devices experience reduced access to classroom instruction and impaired language development. These findings align with WHO (2016), which emphasizes that uninterrupted access to functional amplification is a cornerstone of educational and communicative development for children with hearing impairment.

Parental support and counselling were inconsistently implemented. While slightly more than half of the institutions informed parents about their child's hearing condition (56.3%) and provided guidance on hearing aid care (53.1%), formal counselling sessions (43.8%), regular progress meetings (40.6%), and parental involvement in decision-making (37.5%) were limited. These results indicate that structured family engagement is not systematically ensured, despite research demonstrating that parental involvement significantly enhances adherence to device use, intervention consistency, and overall communication outcomes (Romski et al., 2010; WHO, 2021).

Institutional support was similarly mixed. Most schools reported administrative backing for audiological services (59.4%), yet only 21.9% had adequate budgets, and regular professional development workshops were conducted in 31.3% of institutions. Half of the institutions had staff trained to handle children with hearing impairment (50.0%), but only 37.5% of respondents considered audiological services adequate in meeting students' needs. This reflects a gap between administrative support and the resources required for comprehensive service delivery, a finding supported by prior research highlighting that institutional commitment alone is insufficient without appropriate funding, training, and infrastructure (WHO, 2016; JCIH, 2019).

One-way ANOVA results further indicated significant differences in audiological services across working settings, including schools, hospitals, and clinics. Significant variations were observed in personnel availability, hearing assessment, monitoring and follow-up, equipment and facilities, hearing aid services, and institutional support (all $p < .05$). These results suggest that service quality is not uniform across settings, with schools generally demonstrating more structured services for basic assessment but hospitals and clinics varying widely in the availability of advanced diagnostic tools and follow-up procedures.

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This variability corroborates international evidence that service disparities across contexts influence accessibility, continuity of care, and overall effectiveness of audiological interventions (WHO, 2021; ASHA, 2004).

Overall, the findings indicate that while basic audiological services exist in many institutions, significant gaps remain in advanced diagnostics, hearing aid support, parental engagement, and institutional commitment. These gaps may impede timely intervention, functional amplification, and educational participation for children with hearing impairment. Addressing these limitations requires strengthening the audiology workforce, improving infrastructure, ensuring consistent parental involvement, and enhancing administrative and financial support. Such interventions are essential to align service provision with best practices in early identification, amplification, and rehabilitation, ultimately supporting children's communication development, academic achievement, and social inclusion (WHO, 2016; ASHA, 2004; JCIH, 2019).

Summary

This study examined the availability, adequacy, and appropriateness of audiological services for children with hearing impairment in special schools and institutes of Lahore. A total of 32 audiologists participated, revealing that while basic services such as pure tone audiometry and annual hearing assessments are relatively common, advanced diagnostic tools like OAE and ABR testing, as well as support services including hearing aid fitting, repair, and assistive listening devices, are limited. Parental support and counselling were inconsistently implemented, and institutional commitment in terms of dedicated budgets, trained staff, and professional development was insufficient in many cases. One-way ANOVA analysis showed significant differences in service availability and quality across different working settings, including schools, hospitals, and clinics, indicating uneven provision of audiological care. Overall, the findings highlight substantial gaps in personnel, equipment, monitoring, and administrative support, which may impede timely intervention, functional amplification, and educational participation for children with hearing impairment. Strengthening workforce capacity, infrastructure, parental involvement, and institutional support is essential to ensure comprehensive audiological services that facilitate children's communication, learning, and social inclusion.

Recommendations

Appointment of Qualified Audiologists: Institutions should ensure that trained and qualified audiologists are employed in all special schools and institutes to provide consistent and professional audiological care (ASHA, 2004; WHO, 2021).

Professional Development: Regular workshops, training sessions, and continuing education programs should be conducted to enhance the skills and knowledge of audiologists and supporting staff.

Provision of Advanced Equipment: Schools and institutes should invest in advanced diagnostic facilities, including OAE and ABR testing equipment, sound-treated rooms, and tools for hearing aid verification, repair, and earmould preparation.

Regular Monitoring and Follow-Up: Standardized procedures for monthly and annual hearing assessments should be implemented, and follow-up assessments should be conducted whenever changes in hearing are suspected.

Parental Involvement: Parents should be actively informed about their child's hearing condition, involved in decision-making regarding interventions, and guided in the care and maintenance of hearing aids.

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Adequate Budget Allocation: Institutions should allocate dedicated budgets for audiological services to ensure sustainability of equipment, staff training, and regular service provision.

Integrated Support System: Stronger coordination between clinical, educational, and family settings should be promoted to ensure that children receive consistent and effective audiological support across all environments.

Policy and Institutional Support: Authorities and school administrations should prioritize audiological services within institutional planning and policy frameworks to address gaps and ensure that services meet the developmental and educational needs of children with hearing impairment.

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