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Experiences of Artificial Intelligence Use among Speech-Language Pathologists in Pakistan: Current Practices and Perceived Clinical Effects

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ABSTRACT

Artificial intelligence (AI) is increasingly influencing speech-language pathology practice; however, evidence from low- and middle-income countries remains limited. This qualitative descriptive study explored how speech-language pathologists (SLPs) in selected clinical and educational settings in Pakistan use AI tools, experience their adoption, perceive their effects on clinical work, and envision their future integration. Seventeen practicing SLPs were purposively recruited. Data were collected through semi-structured interviews and analyzed using Braun and Clarke's six-phase thematic analysis framework. Five themes emerged: AI as an emerging but narrow toolkit, learning by doing through self-directed adoption, structural and contextual barriers to integration, perceived efficiency and engagement benefits, and future directions for responsible implementation. Participants primarily used generative AI tools such as ChatGPT for documentation, therapy planning, home programmes, and educational material development, whereas specialized AI applications for assessment and intervention were rarely available. Limited formal training, subscription costs, inadequate digital infrastructure, uncertain accuracy, and poor support for Urdu and regional languages constrained adoption. Participants perceived AI as a useful complement to professional practice but emphasized that all outputs require clinician review. Structured training, ethical guidance, secure institutional policies, and locally adapted tools are needed to support responsible AI integration in Pakistani speech-language pathology services.

Introduction

Artificial intelligence (AI) is no longer an experimental technology but a practical tool that is transforming healthcare delivery, ranging from diagnosis to treatment planning, documentation to patient monitoring (Topol, 2019). According to Davenport and Kalakota (2019), there is a crucial need in the field of medicine for AI to complement, rather than replace, clinicians, to reach its full potential in the near future. Given the potential opportunities and threats of these systems, the World Health Organization (WHO) has released guidance for the ethical, equitable, and clinician-supervised use of AI in health (2021). In this larger digital revolution, the field of speech-language pathology has proved itself to be an area with much potential for innovation that can be brought to bear by AI tools, as speech, language, and voice are signals rich in data and therefore readily available for computational analysis.

The use of AI in speech-language pathology is increasingly reported in the international literature. While AI systems can assist speech-language pathologists (SLPs) with various aspects of clinical care, such as screening and assessment, therapy planning, and progress monitoring, meaningful clinician engagement is important and necessary, according to Suh et al. (2024). Bhardwaj et al. (2024) provide an overview of how machine learning models are revolutionizing the diagnosis and management of speech and language disorders in children. Adikari et al. (2024) conducted a scoping review to chart the wide range of AI applications in adult neurogenic communication disorders for aphasia diagnosis and management. Automatic speech recognition has also been found to have potential for large-scale screening of children with speech sound disorders, but there are still technical and ethical difficulties to overcome (Liu et al., 2024). In addition to assessment, augmentative communication tools for people who have severe speech impairments are being developed using AI technology (Evangeline et al., 2024). In more recent times, advancements in the field of large language models (LLMs) have sparked growing excitement within the realm of clinical AI, as tools like ChatGPT are already transforming documentation, education, and clinical management in health professions (Khan et al., 2023). In addition to these text-based systems, mobile therapy applications have also become part of the work of pediatric SLPs (Du et al., 2023), and Georgieva-Tsaneva et al. (2023) point to the potential of socially assistive robots as engaging and interactive therapy scenarios.

Despite this technological push, adherence research continues to reveal that adoption is greatly influenced by the context, training, and acceptance of the clinicians. Leinweber et al. (2023) identified that therapists' acceptance and perceived usefulness of technology is crucial for successful digital participation in speech and language therapy in a German survey. Similar studies have been conducted in other countries, such as Iran, where SLPs were interested in using mobile health technologies but lacked sufficient knowledge (Saeedi et al., 2023), and Malaysia where SLPs reported low levels of knowledge about the applications of therapy in mobile health applications (Kamaruddin et al., 2023). The COVID-19 pandemic sped up digital uptake across the globe – voice clinicians in the United States were quick to adopt teletherapy despite infrastructural hurdles (Gherson et al., 2023), speech-language therapists in South Africa identified benefits and inequities in the use of distance services (Gallant et al., 2023), and surveys in the United Kingdom showed ongoing uncertainties regarding the validity of tele-assessment for aphasia (Hilari et al., 2023). Research in South Asia has shown that technology-enabled services are particularly appealing in countries where there is an acute shortage of professionals, as Mohan et al. (2017) have shown in India, a neighboring country.

P Pakistan is an important context that has not been studied much and warrants attention in the field of speech-language pathology and use of technology. Speech-language pathology services are not evenly distributed and tend to be more widely available in large urban centers, and many clinicians have limited access to digital resources. In the context of COVID-19, Akram et al. (2021) found moderate satisfaction and competence among Pakistani SLPs in telepractice, suggesting that they are positive about technology-based service delivery. More recently, Ain and Imtiaz (2025) reported on the perceived usefulness and usability issues as experienced with technology in a resource-limited speech-language therapy context. These all point towards the fact that Pakistani clinicians are incorporating digital tools into their practice, yet the use of AI in clinical settings is not fully captured.

To date, there are a few reports of SLP use of AI technology that focus on a qualitative analysis of the tools used, how they are integrated into SLPs' everyday practice, the factors that influence adoption, and the impact of AI tools on clinical practice. This is significant as most of the tools available now were created with the English-speaking majority in mind and may not capture the linguistic and service delivery context in Pakistan. The present study therefore sought to explore the current scenario, experiences, and perceptions of the speech-language pathologists (SLSPs) regarding the use of AI tools in a selected context of Pakistan. Specifically, it considered what type of tools were used, which clinical and administrative tasks these tools were used for, what factors influenced uptake of these tools, and practitioners' perceptions of the responsible future integration.

Research Objectives

1. To explore the types of AI tools used by speech-language pathologists in Pakistan in their clinical practice.
2. To understand the experiences of speech-language pathologists in adopting AI tools, including challenges and facilitators.
3. To explore speech-language pathologists' perceptions of the effects of AI tool use on clinical work and service delivery.
4. To gain insight into their perspectives on the future integration of AI in speech-language pathology practice in Pakistan.

Literature Review

Types of AI Tools in Speech-Language Pathology Practice

A substantial body of research has documented the range of AI technologies now available to speech-language pathologists (SLPs). Brahmi et al. (2024) conducted a systematic review of machine learning methods used for the diagnosis and treatment of speech disorders, which included various acoustic classification models, deep neural networks, and more. Tabby Talks is an automated assessment system for childhood apraxia of speech that incorporates a mobile application with server-based speech analysis, one of the first clinically oriented tools, developed by Shahin et al. (2015). Finally, in adult populations, natural language processing is useful for recognizing Alzheimer's disease with excellent accuracy from the linguistic characteristics of narrative speech (Fraser et al., 2016). Likewise, technologies are increasingly promoted as digital

biomarkers for detecting and tracking a variety of health conditions through voice (Fagherazzi et al., 2021). Azevedo et al. (2023) performed a scoping review of the applications of AI for aphasia rehabilitation, including those for assessment, therapy delivery, and outcome prediction. The introduction of generative AI has expanded this arsenal significantly: Birol et al. (2025) demonstrated that ChatGPT-4.0 generated clinically relevant content for report writing, therapy planning and stimulus generation in seven sets of disorders. Conversational agents have also been studied as language-learning partners (Belda-Medina & Calvo-Ferrer, 2022) and some commentary has emerged about ChatGPT's potential as an assistive tool for the speech-impaired (Bhamidipaty et al., 2025).

Experiences, Challenges, and Facilitators of AI Adoption

Studies of the experiences of clinicians show a nuanced and mixed response of cautious optimism. Austin et al. (2024) found that in a study of 107 SLPs and students from the United States, participants were willing to use AI to assist with administrative and material generation activities; however, they were concerned about the accuracy, ethics, and the possibility of clinician replacement. Similar ambivalence was reported in Indian audiologists and SLPs, who recognized the potential of AI but pointed to a lack of training as a significant challenge (Aggarwal et al., 2025). In the dysphagia specialty, Sharma et al. (2025) found that overall, attitudes were positive, but the level of awareness about AI applications was low. Findings from allied health professions corroborate these findings: those with prior experience with AI were found to have more positive perceptions of AI in health professions students (Alkhaaldi et al., 2023). The literature on digital practice argues that this experience follows previous stages in the technology diffusion process. The literature on digital practice claims that such experiences follow previous stages of technology diffusion. Over 10 years ago, Theodoros (2011) stated that evidence, infrastructure and professional acceptance were vital conditions for telepractice implementation and adoption, and qualitative interviews by Tucker (2012) found training needs and technical challenges were common obstacles to AI uptake, relevant issues today. A scoping review of tele-speech services for children in low and middle-income (LMI) settings revealed the importance of connectivity, cost and family digital literacy in determining service feasibility, which is similar to the Pakistani context (Hassanati et al., 2023).

Perceived Clinical Outcomes of AI Tool Use

In addition to adoption, researchers have started to try to measure the impact of AI on clinical outcomes. When integrated judiciously in clinical workflows, AI systems can improve the accuracy of diagnosis and the uniformity of treatment in various medical fields, as argued by Jiang et al. (2017). Luo et al. (2025) performed a narrative review of how ChatGPT could be applied in rehabilitation medicine, particularly in patient education, documentation efficiency, and individual program design, and noted that the risk of hallucinated content exists in this context. There is also further nuance provided by clinician-mediated comparisons, and Kong (2025) compared clients who had acquired communication disorders with AI-assisted interpretation and human interpretation, finding that AI could increase access for linguistically diverse clients, but it still lacks cultural sensitivity. In the service delivery models, Mallipeddi et al. (2023) envision hybrid systems, where telepractice is supported by AI, which could enhance the continuity of care.

Future Integration, Training Needs, and Ethical Considerations

The consensus in the literature is that integration must be intentional and must be based on moral principles. Concerns regarding informed consent, data privacy, algorithmic bias, and transparency are salient in the field of language technologies in clinical practice, as Diaz-Asper et al. (2024) pointed out in their framework. In multilingual settings where data is limited, informed consent, data privacy, algorithmic bias, and transparency are paramount concerns in the context of language technologies in clinical practice, as Diaz-Asper et al. (2024) noted. The use of most speech AI systems is largely based on English-language data, posing equity issues for clinical populations in Pakistan, including those in Urdu, Punjabi, Sindhi, and Pashto. As a group, this literature reflects rapid technological advances and ongoing human, infrastructure, and ethical issues. Most empirical research on SLPs' AI experiences has come from high-income countries or from quantitative surveys which do not provide a richness of clinicians' lived experiences. To date, there have been no published qualitative studies that examine the current adoption of AI tools among Pakistani SLPs, potential barriers and opportunities involved, perceived impacts of using AI, and the prospects of AI tools in their practice. This is where the present study comes into play, which examines this gap with in-depth qualitative research aligned with 4 research objectives. For this study, AI tools were defined as systems that employ automated speech analysis, natural-language generation, prediction, adaptive decision support, or machine learning. If these functions were not present in the platform or app, they were considered part of the traditional digital technologies of conventional telepractice platforms and mobile apps that are not adaptive.

Methodology

Research Design

A qualitative descriptive design approach was used in this study to understand the utilization and experiences of artificial intelligence tools by speech-language pathologists in Pakistan. The design was chosen as it facilitates an easy, practice-based description of participants' experiences, perceived effects, challenges, and recommendations without being too abstract and imposing an interpretive framework.

Participants and Sampling

17 practicing speech-language pathologists (SLPs) from selected clinical/educational settings in Pakistan participated in the study. Clinicians whose experience or familiarity with AI and related digital tools was identified were recruited through purposive sampling. This criterion does not represent the experiences of all SLPs in the country, but only those who are using and/or aware of AI. The collection and initial analysis of data were done together. Data saturation was reached, and data collection stopped when no new themes emerged. Substantively new codes were not identified following the 15th interview, and two further interviews were carried out to ensure thematic sufficiency.

Table 1 Participant Characteristics (N = 17)

Characteristic	Category	*n*
Gender	Female	11
	Male	6
Highest qualification	BS Speech-Language Pathology	5
	MS/MPhil Speech-Language Pathology	9
	PhD	3
Clinical experience	1–5 years	4
	6–10 years	7
	More than 10 years	6
Primary practice setting	Hospital/Clinic	4
	Educational Institution	9
	Other (Private Practice/Rehabilitation Centre)	4

Data Collection

Semi-structured, in-depth interviews were conducted with a researcher-developed interview guide, which was designed to address the study's objectives. The interviews were designed to delve into the participants' experiences with AI adoption, their perceptions of its impact in clinical settings, the challenges they faced in implementing AI, and recommendations for future integration. Depending upon the location and availability of participants, each interview was held in person or online (Zoom or Google Meet), and averaged 30-45 minutes. All participants gave written informed consent before conducting interviews. All interviews were consented to, audio-recorded, and then transcribed verbatim for thematic analysis.

Data Analysis

The interview recordings were transcribed word for word and analyzed using the six-phase thematic analysis of Braun and Clarke (2006): familiarization with the data, initial coding, developing candidate themes, review of themes, definition and naming of themes, and production of the report. The analysis was inductive as it allowed themes to arise from the participants' experiences and concentrated on their intended meanings. Researchers manually coded the transcripts using repeated reading of the text and systematically identifying meaningful segments of the data. The coding process and the themes that developed were checked and discussed by the research team until it was agreed upon, ensuring that the analysis was credible and consistent. Interviews were conducted in Urdu, which were then transcribed into English and compared with the original recorded interviews to ensure that the participants' meanings were accurately captured. Minimal editing was done to the participant quotations to make them grammatically clear and readable, while maintaining their meaning.

Trustworthiness and Ethical Considerations

The trustworthiness of the findings was enhanced through reflexive note-taking, maintenance of an audit trail, and member checking. A preliminary analysis of the results was presented to a sub-

sample of participants to ensure that the analysis was in line with their experiences and no substantive modifications were recommended. Ethical approval was given before the data were collected, and written informed consent was obtained from all subjects before interviews. All the transcripts were anonymised and participants were given unique codes (e.g. P1–P17) to ensure confidentiality, and all recordings and transcripts from interviews were kept securely. Participants were informed about their right to drop out of the study at any time during the study, without any negative consequences, before data analysis.

Results and Discussion

Theme 1: AI as an Emerging but Narrow Toolkit

The results suggested that the use of AI has started to penetrate the practice of SLP in Pakistan, but is limited to some extent. The most common ways participants saw the use of AI were in the preparation of therapy materials, the creation of programmes for home use and writing clinical reports. Conversely, the use of specific AI tools for speech assessment and intervention was minimal, primarily due to their scarcity and accessibility in Pakistan's clinical context.

Participant 3 stated,

"For me AI means ChatGPT, honestly. I use it almost daily to make word lists and picture ideas for my articulation clients."

Similarly, Participant 9 explained,

"When I have to write a progress report in English, I write the points and ChatGPT makes it professional. It saves me from sitting till late evening."

However, one participant highlighted the limited availability of specialized AI systems:

"Our assessment is still paper, pencil, and my ears. The AI assessment tools you read about in journals have not reached our departments." (Participant 6)

The results indicate that the use of AI by the SLP participants was accessible and not clinically specialized. Tools chosen were inexpensive, familiar, and readily available to clinicians, although not developed or tested specifically for the speech-language pathologist. Austin et al. (2024) also reported that clinicians were more inclined to incorporate generative AI in documentation and material creation than in making a diagnosis. Additionally, Birol et al. (2025) and Khan et al. (2023) noted that ChatGPT is increasingly being utilized for report generation, planning, and educational materials.

While there has been some research internationally on AI-assisted assessment and rehabilitation (Adikari et al., 2024; Bhardwaj et al., 2024; Liu et al., 2024), participants indicated a lack of access to these specialized systems. They describe a disconnect between innovation and the availability of experiments in the clinic in developing countries. The initial phase of AI integration in Pakistan might thus be happening in the form of over-the-counter generative AI apps instead of approved clinical applications.

Theme 2: Learning by Doing: Self-Driven Adoption

The participants consistently indicated that they had self-initiated rather than formally educated or trained in the use of AI tools. The majority of learned about AI through YouTube tutorials, webinars, colleagues, social media and personal experimentation. No one reported being formally trained in AI in their college or professional experience.

Participant 1 stated,

"Nobody taught us this in university. I saw a video on YouTube about ChatGPT for therapists and I just tried it myself."

Similarly, Participant 12 explained,

"My junior colleague showed me how she makes flashcards with AI. That is how I started—from a WhatsApp message, not from any workshop."

The lack of formal training was further highlighted by Participant 16, who remarked,

"In my eight years of practice, I have not received a single official training on digital tools, let alone AI."

The results show that Pakistani Speech-Language Pathologists are integrating AI mostly through their own efforts and not institutional support. Austin et al (2024) found that clinicians were interested in generative AI but not well educated or guided in their profession. Similarly, inadequate training of AI is cited as a key barrier to the adoption of this technology by speech-language professionals (Aggarwal et al., 2025) and digital competence and confidence are identified as being crucial factors in successful technology integration for clinicians (Leinweber et al., 2023).

The results underscore the importance of integrating AI-related topics into the Speech-Language Pathology educational programs and professional development courses in Pakistan. The use of AI in clinical practice would be improved, enabled and appropriate through formal training and/or practical workshops for clinicians.

Theme 3: Structural, Financial, and Linguistic Barriers to AI Integration

Participants recognized multiple factors that hindered the successful integration of AI into SLP practice. The most common issues mentioned were unreliable internet connection, expensive subscription fees, Urdu and regional language support was not available, accuracy of AI-generated content was a concern, and lack of institutional resources. Although the participants had a mostly positive attitude towards using AI tools, these barriers prevented them from using the technology in their day-to-day tasks.

Participant 5 explained,

"Sometimes the internet is so slow that I stop using AI altogether because it interrupts the therapy session."

Another participant highlighted the financial burden of AI tools:

"Most advanced AI tools require paid subscriptions, and many therapists simply cannot afford them." (Participant 11)

Language limitations also emerged as a major concern. Participant 8 stated,

"Most AI tools understand English very well, but they don't work properly with Urdu or our regional languages, which limits their usefulness with children."

The results suggest that Pakistani SLP's still face technological, financial, and linguistic challenges for the use of AI. Like Saeedi et al. (2023), who found infrastructure challenges, financial restrictions, and organizational support as major barriers to digital health implementation, similar issues are noted here. Similarly, Kamaruddin et al. (2023) and Adikari et al. (2024) found that the cost of AI technologies, lack of infrastructure, and limited language adaptation are key barriers to using AI in SLP services.

The results indicate that capacity building in digital infrastructure, AI solutions and promotion of Urdu and regional languages are crucial for the effective use of AI in speech-language pathology clinics in Pakistan. Equitable access and broader clinical implementation would also be enabled by institutional investment and locally adapted AI technologies.

Theme 4: Perceived Efficiency and Engagement Benefits

Participants found AI to be beneficial for enhancing the efficiency of specific clinical and administrative tasks. They reported less time to prepare and document therapy materials, more ease in creating individualized therapy materials and more engagement of some children during interactive activities. No patient outcome data were collected and used to verify these accounts. It was consistently highlighted that AI should not replace human expertise.

Participant 4 stated,

"AI saves me a lot of time when preparing therapy activities. I can spend more time with the child instead of making materials."

Similarly, Participant 10 explained,

"Children become more interested when therapy includes interactive AI-based activities. They participate more and stay focused for longer."

Despite these benefits, one participant stressed the importance of professional oversight:

"AI gives useful suggestions, but I always review everything before using it because clinical decisions should remain the therapist's responsibility." (Participant 14)

The accounts assume that AI is a helper for preparation, documentation, and creation of materials, and not a clinical decision-maker. Birol et al. (2025) also noted that generative AI could be used to assist with documentation and preparation of therapy, and Du et al. (2023) and Gallant et al. (2023) demonstrated that well-chosen digital technologies can help with engagement and continuity of care. The present results, however, do not validate clinical effectiveness, but rather clinicians' perception of what AI has contributed to their work.

Overall, the participants had a positive outlook on AI as a helpful adjunct to traditional speech-language pathology services. The perceived value was linked to the careful review of the clinician, proper adaptation to the individual client, and a conscious consideration of the limitations of content generated by AI.

Theme 5: Future Directions for AI Integration in Speech-Language Pathology

Participants were hopeful about the future use of AI in speech-language pathology and the emphasis placed on responsible and appropriate use. The majority thought that AI can play a significant role in clinical practice in Pakistan if properly trained, if ethical boundaries are set, and if there is institutional investment and AI tools developed in Urdu and regional languages.

Participant 2 stated,

"AI will definitely become part of our profession in the future, but therapists need proper training before using it confidently."

Another participant highlighted the importance of language localization:

"If AI tools can understand Urdu and our regional languages better, they will be much more useful for children in Pakistan." (Participant 13)

Ethical concerns were also emphasized. Participant 15 remarked,

"Patient privacy and confidentiality should always come first. AI should assist therapists, not replace them."

The results suggest that SLP's are optimistic about the potential of AI technology, but suggest that it is important that the technology be locally relevant, educationally sound, and managed ethically. Similar findings were reported by Austin et al. (2024), who highlighted the need for AI literacy and professional guidance among Speech-Language Pathologists. Similarly, Adikari et al. (2024) and Georgieva-Tsaneva et al. (2023) all stressed the importance of clinician training, ethical safeguards, and the development of technologies to suit local clinical contexts when integrating AI into routine clinical practice. Overall, the participants conceptualized AI as a helpful assistant to speech-language pathologists, but not a clinician. Enhancing AI education, creating culturally and linguistically sensitive applications, and establishing national ethical guidelines will play a crucial role in ensuring the safe and effective use of AI within speech-language pathology services in Pakistan.

Conclusion

This qualitative study identified an informal, accessibility-driven pattern of AI adoption among participating speech-language pathologists in Pakistan. There was a focus on the use of general-purpose generative tools, such as ChatGPT, to support documentation, therapy plans, home programmes, and the creation of content. Only a few specialized AI systems for assessment and intervention were reported. Most of the adoption was being driven by the participants, as they had had limited formal education or institutional training in AI.

Participants felt that AI could help them save time on preparation and be helpful for clients, but not as a substitute for professional judgment. Financial, connectivity, accuracy, privacy, and

insufficient support for Urdu & regional languages were the barriers to routine use. AI education should be incorporated into professional curricula; to continue professional development, institutional policies should be developed to ensure security, ethical guidance must be provided, and locally validated tools must be developed for responsible integration. The results reflect clinicians' perceptions and should not be viewed as an actual measure of clinical effectiveness or national prevalence.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Include AI education in Speech-Language Pathology curriculum to prepare future clinicians with knowledge and skills to effectively and ethically utilize AI technologies.

2. Make available regular continuing professional development (CPD) programmes, workshops, and hands-on training to enhance the AI literacy of Speech-Language Pathologists.

3. Support the provision of affordable and culturally appropriate AI tools to facilitate the use of AI tools in clinical settings in Urdu and regional languages, making the use of AI more relevant and easily available for Pakistan.

4. Define national and institutional principles and boundaries regarding informed consent, patient privacy, data security, transparency, professional accountability, and entering identifiable patient data into unauthorized public AI platforms.

5. Improve institutional support and digital infrastructure, such as internet connectivity, availability of AI applications licensed for use, and promoting healthcare organizations to implement evidence-based AI technologies.

6. Promote geographically representative, large-scale, and diverse research that engages AI users and non-users and explicitly assesses the accuracy, acceptability, safety, and clinical value of AI-aided speech-language pathology services.

Limitations

The results should be understood within a number of limitations. The sample size was small and purposive, which may have resulted in over-representation of clinicians who are more interested in technology than the overall SLP population. Results are self-reported perceptions, and the study did not directly assess the accuracy, safety, or clinical validity of the AI-generated content presented to participants. Some health-care providers in rural areas, the public sector, and in some provinces were also underrepresented. Thus, the results are only applicable to comparable settings, and cannot be extrapolated to the national level.

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