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CHALLENGES OF USING ARTIFICIAL INTELLIGENCE APPLICATIONS IN SPEECH-LANGUAGE THERAPY PRACTICE IN PAKISTAN

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Abstract
Artificial Intelligence (AI) is increasingly being integrated into speech-language therapy; however, its implementation in Pakistan remains underexplored. This qualitative study investigated the challenges associated with the use of AI applications in speech-language therapy practice in Punjab, Pakistan. Semi-structured interviews were conducted with 32 Speech-language pathologists (SLPs) having 5–7 years of professional experience and experience using AI applications in clinical settings. Data were analyzed using thematic analysis. The findings revealed several challenges, including financial constraints, subscription costs, technological and infrastructural limitations, lack of professional training, ethical and privacy concerns, cultural and linguistic barriers, concerns regarding clinical reliability, and limited institutional and policy support. Despite these challenges, participants acknowledged the potential of AI applications to enhance therapy planning, documentation, assessment support, and client engagement. Addressing these barriers may facilitate the effective and responsible integration of AI into speech-language therapy practice in Pakistan.

Introduction
The integration of artificial intelligence (AI) in healthcare is rapidly transforming various aspects of clinical practice globally, especially in speech-language therapy (SALT). AI systems are computer systems that are able to do things that normally take human intelligence, for example, speech recognition, language processing, decision-making, pattern identification, and automated feedback (World Health Organization [WHO], 2021). Examples of the applications of AI in speech-language therapy include the use of AI for assessment, screening, analysis of speech sounds, language intervention, fluency monitoring, voice therapy, augmentative and alternative communication, and support for home practice (Suh et al., 2024). These applications could enable Speech-language pathologists to deliver more individualized therapy, monitor client progress, and beyond the walls of the clinic (Dadgar et al.,

2025). The effectiveness of AI in SALT requires professional training, ethical considerations, infrastructure, and cultural adaptability, in addition to the availability of technology (Alsobhi et al., 2022).

As of now, the integration of AI tools in speech-language therapy (SLP) is still at its early stages in Pakistan. The present situation of speech-language therapy services has already been constrained due to limited access to rehabilitation services, financial resources, and lack of awareness among parents and communities regarding the need for speech-language therapy services, as well as shortage of trained professionals for speech-language therapy (Akhtar et al., 2024). In this context, AI tools can provide novel opportunities, assist in early identification, provide remote therapy, facilitate parent-led activities and support low-cost digital intervention (Muttiah et al., 2022). Another way technology can help children who have communication disorders is by providing repeated practice, visual feedback, and activities for interaction and learning. Despite the advantages of digital technology in SLP, its usage is still unevenly distributed, with technical, training and financial constraints particularly restricting its use when resources are limited (Yawar & Asif, 2022).

However, there are some challenges to consider in the implementation of AI applications in the practice of speech-language therapy in Pakistan. Limited professional training is one of the challenges. Not all Speech-language pathologists may be trained on how to use AI-based tools for clinical assessment and intervention. However, non-specialists may struggle to assess the accuracy, reliability and appropriateness of the use of artificial intelligence (Austin et al., 2025). This can impact clinical decision-making and can lead to reliance on tools, which are not completely validated for the Pakistani populations. The products of AI, created in Western contexts, might not accurately mirror local languages, accents, dialects, expressions and communication styles (Bender et al., 2021). This is especially true in Pakistan where Urdu, Punjabi, Sindhi, Pashtu, Balochi, Shina, Balti and other regional languages are spoken on a day-to-day basis.

Ethics and professional responsibility are another significant challenge. Healthcare AI tools need to be privacy-protective, safe, transparent, and supervised (World Health Organization [WHO], 2021). Clients can be children, persons with disabilities and people with complex communication needs for speech-language pathology. Confidentiality is crucial for their data, voice samples, therapy records, and assessment results (Nisha et al., 2025). There could be potential dangers such as data leakage, misuse, or misinterpretation if AI applications are used to gather or store sensitive data without adequate protections. Furthermore, WHO (2025) points out that the regulation of large AI systems in healthcare needs to be handled with care as they can generate biased, unsafe or incorrect outputs (World Health Organization [WHO], 2025). For this reason, it is essential that professionals rely on AI in conjunction with their expertise, rather than entirely relying on it.

Additionally, financial and infrastructural challenges hinder the proper application of AI in Pakistan. The stability of internet, updated devices, paid software, and technical support may not be readily available for many clinics, schools, hospitals, and rehabilitation centres (Moulaei et al., 2025). Low-income families may not have access to smartphones and tablets, subscriptions or constant internet access. This will raise the likelihood that inequality will be exacerbated by AI-assisted therapy, as it will only be accessible to families living in urban and economically stable areas (Shafi et al., 2022). The digital divide in rural and underserved areas can also further limit access to quality speech-language therapy services.

Hence, challenges in implementing AI applications in speech-language therapy practice in Pakistan are important to be studied. This type of study can shed light on the practical, ethical, professional, linguistic, cultural, and institutional obstacles Speech-language pathologists encounter. It can also serve as a tool for training programs, for developing policies, for designing local artificial intelligence tools, and for the responsible incorporation of technology into clinical practice (Aggarwal et al., 2025). The application of AI in the field of speech-language therapy in Pakistan

can be beneficial, but it should be implemented with professional competence, ethical considerations, cultural context, and ensuring access to all (Topol, 2019).

Research Question

Artificial intelligence (AI) applications can be implemented to improve assessment, intervention, and service delivery in speech-language therapy. The adoption of these technologies, however, is determined by many professional, technical, ethical and contextual factors. Considering the scarcity of evidence for the use of AI applications in the practice of speech-language therapy in Pakistan, their experiences and perceptions should be investigated. Thus, the current study is designed to explore the difficulties faced by Speech-language pathologists while working with AI based applications in the field of speech-language therapy in Pakistan.

The central research question is:

What challenges do Speech-language pathologists in Pakistan perceive in the use of artificial intelligence applications in speech-language therapy practice?

Sub-Questions

What technological barriers do Speech-language pathologists encounter when using AI applications in clinical practice?

What professional and training-related challenges affect the adoption of AI applications in speech-language therapy?

What ethical and privacy concerns do Speech-language pathologists associate with the use of AI applications?

How do contextual factors such as cost, infrastructure, language, and cultural relevance influence the use of AI applications in Pakistan?

Methods

Participants

The participants of this study were 32 Speech-language pathologists (SLPs) from different clinical, educational and rehabilitation settings in the province of Punjab, Pakistan. The number of years of professional experience ranged from 5 to 7 years with 6 years being the most common, and all participants indicated that they incorporated artificial intelligence (AI) applications into their assessment, intervention, or therapy sessions. The participants were selected through purposive sampling, as all respondents had experience in speech-language therapy practice and experience with AI-powered therapeutic tools.

The participants came from various professional settings such as hospitals, private clinics, special education institutions and rehabilitation centers. Their AI application experiences helped them to offer evidence-based comments on the opportunities and challenges of integrating AI into speech-language therapy.

Professional networks were used to reach potential participants, who were then invited to participate in the study voluntarily. The study was purposefully explained to the participants and informed consent was taken from all the participants before the data was collected. There was no requirement for participation and confidentiality and anonymity were guaranteed throughout the research process. The study was carried out, giving due respect to all the ethical principles applied to research involving human beings, such as respect for the rights of the subjects, informed decision making and confidentiality.

Data Collection

This study used a qualitative research method. Qualitative techniques are beneficial in the exploration of experiences, perceptions and challenges of participants in great detail. The objective of the present study was to comprehend the challenges faced by Speech-language pathologists in the use of artificial intelligence (AI) applications for speech-language therapy practice in Punjab (Pakistan). The qualitative method was chosen as suitable for the study because it enabled the participants to share their experiences, concerns and professional views on the integration of AI technologies into clinical practice.

The data were collected using an individual semi structured interview with an interview guide prepared by the researcher. The interview guide was made up of two sections. The first part consisted of demographic and professional questions including age, sex, work environment,

years of experience in their profession, and experience with the use of AI applications in speech-language therapy. The second section was dedicated to participants' experience with AI applications, recognizing the advantages, obstacles, ethical considerations, training requirements, technical hurdles, cultural and linguistic considerations, and recommendations for enhancing AI integration in speech-language therapy services.

Interview questions covered areas such as challenges encountered with AI applications, impact of technological and infrastructural factors, ethical or privacy concerns, and the need for support or training to enable effective use of AI in speech-language therapy services.

Interviews were held one-on-one, either in person or on the internet, depending on the availability of the participants and their geographical location. These interviews were conducted for around 20-40 minutes. All interviews were audio-recorded, with participants' permission, to facilitate accurate data collection. After the data was collected the interviews were analyzed by transcribing them word for word. The transcripts were de-identified of any identifying information and participants were given pseudonyms to ensure confidentiality. The main purpose of the interviews was to gain insights into challenges Speech-language pathologists face with the use of AI applications in clinical practice, including professional, technical, ethical, financial, and contextual challenges.

Data Analysis

Thematic analysis was used for analyzing the transcribed interview data. Thematic analysis was deemed appropriate given that the purpose of the study was to identify, analyze and report patterns that emerged in the challenges of using Artificial Intelligence (AI) applications in speech-language therapy practice. Following transcription, the data were read back to the researchers several times to become familiar with participants' responses. Meaningful words, phrases and statements that fit the theme of AI use, challenges, ethical issues, technological challenges, and contextual challenges were then used to generate initial codes. In the following step the same codes were organized into overarching themes. The themes that were beginning to emerge were financial constraints, technological and infrastructural challenges, competency and training problems with professionals, ethical and privacy issues, cultural and linguistic barriers, reliability, and clinical accuracy problems, and institutional and policy-level challenges. Themes were discussed and modified for appropriateness to reflect the participants' experience.

For added trustworthiness, some transcripts were reviewed by a second researcher. Mutual agreement was used to discuss and resolve differences in coding. The last themes were backed up by participants' quotations and are aligned with the major challenges faced by Speech-language pathologists in Punjab, Pakistan, while using AI applications in their clinical practice.

Results

Table 1 AI Applications Used by Speech-language Pathologists in Punjab, Pakistan (N = 32)

Sr.	AI Application	Users (n)	% of SLPs	Primary Clinical Use
1	**ChatGPT**	28	87.5%	Therapy materials, session plans, home programs, progress notes, parent counseling
2	**Google Speech-to-Text**	21	65.6%	Speech transcription, documentation, language analysis

Sr.	AI Application	Users (n)	% of SLPs	Primary Clinical Use
3	**Whisper**	17	53.1%	Speech transcription and clinical documentation
4	**Speech Blubs**	15	46.9%	Speech-language intervention for children with articulation disorders
5	**Otsimo Speech Therapy**	12	37.5%	Language and communication intervention for children
6	**Speech Tutor**	10	31.3%	Articulation therapy with animated mouth/tongue visuals
7	**Articulation Station**	8	25.0%	Structured articulation practice for phoneme production
8	**Constant Therapy**	7	21.9%	Cognitive-linguistic rehabilitation for acquired disorders
9	**Voiceitt**	5	15.6%	Speech recognition for non-standard/atypical speech patterns
10	**Microsoft Azure Speech Services**	4	12.5%	Advanced speech analysis and automated speech processing

Note. *n = number of participants reporting use of application. Multiple applications per participant permitted.*

The data analysis of 32 Speech-language pathologists (SLPs) from clinical, educational and rehabilitation settings from Punjab, Pakistan revealed the following eight major themes related to challenges faced by SLPs in incorporating Artificial Intelligence (AI) applications in speech-language therapy practice. The participants said they were using AI tools to help them, such as ChatGPT, Speech Blubs, Constant Therapy, Otsimo Speech Therapy, Voiceitt, Whisper, Google Speech-to-Text, Microsoft Azure Speech Services, Speech Tutor, and Articulation Station. While participants recognized the potential of AI applications in therapy planning, documentation, speech analysis, guidance for parents, and child engagement, they also noted certain challenges that prevent their successful implementation.

Awareness and Utilization of AI Applications

The participants showed general awareness of the uses of AI and how it can be used in the field of speech-language therapy. Therapy activities, plans for sessions, parent counselling notes, home programs and progress notes were frequently created using ChatGPT. Transcription and documentation were completed using Google Speech-to-Text and Whisper, and articulation, phonological and language activities were primarily carried out using Google Speech Blubs, Otsimo Speech Therapy, Speech Tutor and Articulation Station with children.

Learners shared that they could use AI to save time in preparing therapy sessions and that it helped diversify the materials they used for therapy. At the same time, they noted that the content created by AI systems would not be appropriate to use as is

without considering the client's age, diagnosis, language proficiency, and cultural background, and without further adaptation.

"ChatGPT helps me prepare therapy activities quickly, but I cannot use the material exactly as it is. I have to modify it according to the child's speech and language level." (Participant 5)

"Google Speech-to-Text and Whisper are useful for transcription and documentation, especially when preparing session notes and reports." (Participant 21)

"Speech Blubs and Otsimo are engaging for children because they use visuals and interactive activities, but they still need therapist supervision during sessions." (Participant 12)

Financial Constraints and Subscription Costs

One of the common challenges reported was financial barriers. Many participants reported that they used several speech-language therapy applications based on AI that were useful, but that paid versions of them restricted their use in clinical practice. Particularly, participants noted the benefit of using Speech Blubs, Constant Therapy, Otsimo Speech Therapy, Voiceitt, Microsoft Azure Speech Services, Speech Tutor, and Articulation Station, which are helpful but expensive. Some applications gave free access or trial versions, but participants indicated that the most clinically useful features were only available for paid versions.

Participants in private clinics and rehabilitation centers reported that their clinics would not allocate money towards paying for AI applications. Consequently, therapists relied on the free versions, which lacked many features, or they had to personally pay for a subscription. This was felt to be challenging as therapists needed to use more than one application for various clinical uses.

"Speech Blubs is helpful for children because it keeps them engaged during therapy, but most of the useful features are paid. Many parents are not willing to continue the subscription for a long time." (Participant 6)

"Constant Therapy has good activities for language and cognitive rehabilitation, but it is expensive for routine use in Pakistan. Therapists and clients cannot afford multiple paid applications." (Participant 14)

"Some tools have free versions, such as ChatGPT, Google Speech-to-Text, and Whisper, but the advanced and more accurate features usually require payment." (Participant 21)

"Voiceitt and Microsoft Azure Speech Services may be useful for speech recognition, but their cost and technical setup make them difficult for regular clinical use." (Participant 29)

Technological and Infrastructure Challenges

Many of the participants cited technological and infrastructural challenges as well. The problems faced were: weak internet connection, shortage of digital devices, old computers, software compatibility, and poor technical support in hospitals. The participants explained how AI applications sometimes needed to be connected to a stable network and have the latest devices, which is not always the case in therapy centers.

In major cities, therapists indicated that they found it easier to leverage AI-enabled applications due to more reliable internet connectivity and access to institutional resources. However, technical issues hampered the use of AI tools during therapy sessions, and therapists who were interested in using them were not confident in their ability to use such technology frequently.

"AI applications depend heavily on internet connectivity. When the internet disconnects during a session, the flow of therapy is disturbed." (Participant 9)

"Many clinics do not have updated tablets, laptops, or proper software support, so using AI applications becomes difficult." (Participant 18)

"In smaller cities and rural areas, therapists may know about AI tools, but the required technology is not always available." (Participant 27)

Professional Training and Competency Issues

Another key finding was that not having formal training had an impact on self-assurance in using AI applications. While ChatGPT, Speech Blubs, Whisper, and Google Speech-to-Text are all tools many therapists have used, they mentioned that they learned the majority of the information on their own, not through training. The majority of participants had found out how to use AI via YouTube videos, online learning, webinars, social media or colleagues.

Some participants felt that if not used properly, AI tools could be misapplied by therapists or used to a fault as they might fall for automated suggestions. They stressed the need for training related to artificial intelligence to be integrated into the education of speech-language Pathologists, professional training programs, and continuing education programs.

"We use ChatGPT for therapy planning and parent guidance, but we have not received any formal training on how to use it ethically and clinically." (Participant 8)

"Most therapists learn these applications through YouTube, colleagues, or personal experience. There is no proper training program for AI in speech therapy." (Participant 16)

"AI can support therapy, but without training therapists may use incorrect materials or rely too much on automated suggestions." (Participant 24)

Ethical, Privacy, and Professional Concerns

Another major challenge identified were ethical and privacy issues. Issues raised by the participants included concerns about client confidentiality, data security, informed consent, storage of speech samples, and professional accountability. Many of the apps developed by artificial intelligence need voice input, recordings, written reports, or data about clients, so therapists had their concerns with regards to the storage and utilization of such data. Participants also discussed the trustworthiness of AI-driven recommendations and cautioned that therapists need to take accountability for clinical choices. They believed that AI should be used only as a supportive tool and not as a replacement for professional expertise.

"When we upload a child's speech sample to an AI platform, we are not always sure where that data is stored or who can access it." (Participant 3)

"Client confidentiality is a serious issue because many AI tools are developed outside Pakistan and their data policies are not always clear to therapists." (Participant 11)

"If AI gives a wrong suggestion, the responsibility will still come to the therapist, so we cannot depend completely on these applications." (Participant 22)

"AI should assist the therapist, but the final decision must always remain with the qualified professional." (Participant 30)

Cultural and Linguistic Barriers

The participants consistently mentioned cultural and linguistic restrictions as a significant obstacle for the application of AI in Pakistan. Participants noted that most of the AI tools were created with English language users in mind and did not fully support the local languages of the clients in the region, such as Urdu, Punjabi, Saraiki etc. This made local children and adults' use of AI applications less useful.

Participants also said that speech recognition systems do not recognize local accents and pronunciation patterns or local-specific words. They also observed that the use of pictures, stories, words and examples were not known to the Pakistani children, making the therapy less culturally relevant for them.

"Most AI applications are developed for English-speaking children. When we use them with Urdu-speaking children, the activities are not always suitable." (Participant 4)

"Google Speech-to-Text and similar tools sometimes fail to recognize local accents, especially when the child speaks Punjabi or Urdu with regional pronunciation." (Participant 13)

"Many applications do not match our cultural context. The pictures, examples, vocabulary, and stories are often unfamiliar for Pakistani children." (Participant 19)

"For effective speech therapy in Pakistan, AI tools should include Urdu and regional language support." (Participant 28)

Reliability and Clinical Accuracy of AI Systems

There were some participants who raised concerns about the clinical accuracy and reliability of AI-generated outputs. They said AI applications can create useful activities, transcriptions and suggestions which may not be applicable in every situation. Participants commented that communication difficulties are complex and need individual evaluation and planning for interventions.

Therapists reported some instances where AI generated activities were general and not aligned with the child's diagnosis, developmental age, attention span, or therapy goals. Hence, it was highlighted that all recommendations generated

by AI should be reviewed, modified and approved by therapist before use.

"AI-generated therapy activities can be helpful, but sometimes they are too general and do not match the child's actual therapy goals." (Participant 7)

"ChatGPT gives many ideas, but some activities need correction before they can be used in a clinical session." (Participant 15)

"Speech therapy is not only about activities; it also requires observation, judgment, and adjustment during the session." (Participant 23)

Institutional and Policy-Level Challenges

Institutional and policy-related barriers were also reported by participants. Many hospital, clinic, school, and rehab centers were not aware of the appropriate guidelines for the use of AI applications in speech-language therapy. Institutions were said to promote innovation but lacked resources, training, subscriptions, technical support.

Participants also noted the lack of national level professional guidelines for the use of AI in speech and language therapy. They recommended the creation of ethical guidelines, educational programs, and guidelines by professional organizations, universities, and healthcare organizations on how to responsibly incorporate AI.

"No clear institutional guidelines exist that guide us about what to do with AI in our speech-language therapy sessions." (Participant 10)

"Most organizations will not provide paid tools and/or training for therapists to manage technology." (Participant 17)

Professional organizations should create guidelines for the ethical and safe use of AI in speech-language therapy practice. (Participant 32)

Recommendations for Future AI Integration

A few suggestions for enhancing the application of AI tools in speech-language therapy practice were given by the participants in Pakistan. The most frequent suggestions were formal training programs, integration of AI into university courses, culturally and linguistically relevant applications, and affordable access to paid tools, institutional support and national ethical guidelines.

Participants also highlighted the importance of partnership between Speech-language pathologists, Universities, Software developers, Professional organizations and the policy makers. They felt that if the applications were customized regarding the local therapy needs, clinical realities, and the Pakistani languages, they would become more useful for the Pakistani context.

Participant 2: "It's important to add AI-related courses to the speech-language therapy programs at universities."

"To ensure the development of AI products that support Urdu, Punjabi and other regional languages of Pakistani consumers." (Participant 20)

Therapists will be able to make better use of AI in therapy, if institutions can offer them training, devices, and subscriptions. (Participant 26)

"The use of AI in speech therapy has potential, but needs to be done with guidelines, ethics and professional oversight. (Participant 31)

The results suggest that Speech-language pathologists (SLPs) in Punjab, Pakistan acknowledge the potential of using AI applications for enhancing therapy planning, documentation, speech analysis, and client engagement. Despite the potential benefits of using AI, financial constraints, technological challenges, gaps in professional training, ethical concerns, cultural and linguistic differences, reliability, and institutional and policy barriers persist in the practical application of AI in SLP practice.

Discussions

This study aimed at understanding Speech-language pathologists (SLPs) views regarding the challenges of using Artificial Intelligence (AI) applications in the practice of SLP in the context of Pakistan. The results indicated that participants identified several potential applications of AI for therapy planning, documentation, and assessment support, as well as for engagement with clients, but some challenges remain in the implementation of these technologies in clinical practice (Holden & Karsh, 2010). Financial issues, technological and infrastructural, lack of professional training, ethical and privacy issues, cultural and linguistic issues, clinical reliability issues, and institutional

and policy issues were identified as the major challenges.

The most significant outcome of the research was the financial impact of AI usage. Applications that were commonly cited as useful, but costly include Speech Blubs, Constant Therapy, Otsimo Speech Therapy, Voiceitt, Microsoft Azure Speech Services, Speech Tutor and Articulation Station. While there are free versions of some apps, advanced clinical features were reported to be offered exclusively with paid subscriptions. This is in line with previous studies that have shown financial costs are an important barrier to uptake of digital health technologies in low and middle-income countries (LMICs) where health budgets and personal finances are often constrained (World Health Organization [WHO], 2021). Moreover, in the context of rehabilitation in Pakistan, there are no institutional procurement strategies for DH tools, which exacerbates the affordability challenge (Bonnechère et al., 2023). The results indicate that cost is still one of the key challenges for implementing AI-based rehabilitation services in Pakistan.

Technological and infrastructural issues also arose as major hindrances. The problems reported by participants were the unstable internet connection, limited access to new devices, software compatibility problems, and technical support. The results align with earlier studies, which indicate that sufficient technological infrastructures and digital readiness are essential for the successful implementation of AI technologies (Topol, 2019). The gap in technological capabilities between urban and rural areas could also hinder the potential of AI applications in rehabilitation services in developing nations like Pakistan (Wang et al., 2024). Prior to widespread use of AI in the practice of speech-language pathology, technological infrastructure needs to be enhanced.

One other significant discovery was the lack of skill and digital competence of Speech-language pathologists. The majority of participants said they learned to use AI applications on their own by reading online, asking colleagues for guidance or reading a lot about it and experimenting. Formal education or structured training on AI technologies had not been received by very few participants. Likewise, research on technology use among healthcare professionals suggests that inadequate training can lead to reduced confidence, resistance to innovation, and less effective technology use (Meskó et al., 2018). This is corroborated by studies indicating that unsupervised use of AI skills by healthcare professionals is associated with incomplete or misapplied abilities (Gazquez-Garcia et al., 2025). The results indicate that universities and professional organizations can integrate the above AI-related skills into speech-language pathology undergraduate and postgraduate education and continuing professional development programs.

Participants also raised many ethical and privacy issues. When therapists employed applications that required speech recordings and data, concerns of confidentiality, data security, informed consent, and professional accountability were particularly evident. The results are in line with World Health Organization (WHO) recommendations regarding transparency, privacy protection, human oversight and ethical governance in the use of AI in healthcare systems (World Health Organization [WHO], 2021). Ensuring client information security and privacy is especially important in the Pakistani context, where formal data protection laws are still in their infancy (Duggal et al., 2023). Throughout the sessions, there was a clear emphasis on the need for AI to be used as an aid to clinical decision-making, not as a replacement for it. This discovery corroborates previous studies indicating that AI systems designed with human well-being in mind are more likely to facilitate healthcare delivery that is safe and effective (Topol, 2019).

The study also showed there was significant cultural and linguistic barriers. Participants found that the majority of the AI applications were created for the English-speaking population and the applications were not very effective in Urdu and regional languages. The problem with accent recognition, culturally inappropriate content, and lack of language-specific resources were mentioned over and over. Results align with prior research emphasizing the need for language and cultural appropriation in deploying AI communication

tools to different communities (Bender et al., 2021). The lack of representation in AI training datasets from South Asian languages further exacerbates this challenge (Kamalakannan et al., 2023). In conclusion, the analysis has identified several potential benefits for using AI tools tailored to the Pakistani language and culture, including enhanced clinical outcomes and better acceptance of the technology.Based on the results, there are several potential advantages for using AI tools specifically designed for the Pakistani language and culture, including improved clinical outcomes and greater acceptance of the technology.

Participants also voiced concerns about the accuracy and trustworthiness of AI-generated results. Therapists felt that AI-generated recommendations required a professional touch for the majority of the applications and thought they were effective for generating ideas and supporting documentation with apps like ChatGPT, Google Speech-to-Text, and Whisper. This discovery aligns with existing research suggesting that AI-driven systems can generate inaccurate, incomplete or misleading responses without the involvement of professionals (World Health Organization [WHO] 2025). This reliability issue is also important for clinical populations like children with speech disorders for whom standardized assessment requires high accuracy (Lammert et al., 2025). Communication disorders are complex and assessment and intervention are highly individualized and are not yet easily replicable using automated systems.

Institutional and policy issues also were identified as challenges. Participants pointed out that there are no guidelines, standards, or national policies regarding the use of Artificial Intelligence in this field of speech-language pathology practice. In general healthcare research, the absence of regulations can lead to confusion about moral obligations and quality control, as well as legal liability (Meskó et al., 2018). This aligns with the fact that many LMICs do not have national health strategies for AI, leading to regulatory gap and affecting the responsible implementation of AI (Perrella et al., 2024). The results indicate that professional organizations, healthcare facilities and policy makers need to work together to develop robust standards to enable responsible use of AI in rehabilitation.

The results show that overall, Speech-language pathologists in Pakistan are aware of the significant potential of AI applications that can improve assessment, intervention, documentation, and service delivery. However, the successful implementation demands to overcome financial restrictions, technological infrastructure, professional training, ethical governance, culturally responsive application and supportive institutional and policy frameworks (Hogg et al., 2023). Solving these problems can help in the responsible and effective use of AI technologies in speech-language therapy practice and further enhance rehabilitation results for people with communication problems.

Conclusion

This study highlights that SLPs in Pakistan are aware of the potential of AI applications in speech-language therapy (SALT) for assessment, planning, documentation, monitoring, and counselling parents. Several applications were seen as helpful tools that have the potential to improve efficiency and widen therapy resources: ChatGPT, Speech Blubs, Constant Therapy, Otsimo Speech Therapy, Whisper, Google Speech-to-Text, Voiceitt. But, while there are some advantages to adding AI to speech-language therapy, there are also several major hurdles to overcome.

It found that factors such as costs of subscription, lack of technological infrastructure, limited professional training, ethical and privacy issues, cultural and language barriers, concerns related to clinical reliability, and inadequate institutional and policy support have posed a significant challenge to the widespread use of AI applications in Pakistan. These challenges are especially noticeable in low-resource areas where technology, professional development, and specialized software are limited.

The findings further highlight the importance of developing culturally relevant and linguistically appropriate AI applications that can effectively support Urdu and regional languages. It is also essential to set professional guidelines, ethics, and

regulations for the safe, responsible, and effective application of AI in clinical settings. Participants highlighted that AI is a valuable support tool, but cannot replace the expertise, clinical judgment and individualized decision making of qualified Speech-language pathologists.

In conclusion, the seamless integration of AI into SLP practice in Pakistan is likely to require collaboration between the university, healthcare providers, professional associations, policymakers, and technology providers. Overcoming these barriers can help ensure that the use of AI is responsible and could enhance the accessibility, efficiency, and quality of communication disorders services for beneficiaries.

Recommendations

Based on the findings of the study, several recommendations are proposed to facilitate the effective and responsible integration of Artificial Intelligence (AI) applications into speech-language therapy practice in Pakistan.

1- Integrate AI Education into Speech-Language Therapy Programs

Speech-language pathology training programs at universities should include courses and training in AI. This will allow future Speech-language pathologists to acquire the knowledge and skills needed to effectively incorporate AI applications in assessment, intervention, documentation, and clinical decision making.

2- Provide Continuous Professional Development Opportunities

Organizations like professional associations and healthcare institutions could host training sessions, certification courses, webinars, and practical clinics on the use of AI tools in SLP. These programmes can boost the confidence, digital literacy, and ethical understanding of therapists with regard to AI technologies.

3- Develop Culturally and Linguistically Appropriate AI Applications

There is a need to develop smart applications that will help in Urdu language using AI tools, along with speech-language pathologists who can help design the smart applications for speech support of Urdu and regional languages of Pakistan. Additionally, applications should be culturally appropriate to the local context in terms of communication styles and values, and, in turn, should be clinically relevant to the local context to ensure efficacy and usability.

4 ***-Improve Technological Infrastructure***

Reliable internet connections, modern digital devices, and technical support services should be provided for these institutions, such as healthcare centers, rehabilitation centers, and educational bodies. Technological infrastructure must be strengthened in order to enable the effective implementation of therapeutic practices with support from AI.

5- Enhance Affordability and Accessibility of AI Tools

To lower the cost of AI applications, it is crucial for government agencies, professional associations, and software developers to consider strategies to mitigate the cost. Subscription fees and institutional, student access, and locally created alternatives may expand access for therapists and clients.

6- Characterize ethical and professional guidelines.

The national professional organisations ought to have a detailed code of conduct for privacy, confidentiality, informed consent, data security and professional accountability. Establishing clear standards can help foster safe and responsible use of AI applications in the context of SLP practice.

7- Create national policies on the use of AI in Rehabilitation Services.

Policymakers should develop policies and policy frameworks to inform implementation, evaluation and monitoring of AI technologies in the field of rehabilitation and healthcare. These policies can help offer legal clarity and foster the use of evidence-based AI innovations.

8- Promote Interdisciplinary Collaboration

There is a need to promote mutual cooperation between Speech-language pathologists, computer scientists, software engineers, healthcare providers, universities and policymakers in order to ensure the AI application is clinically relevant, scientifically valid, and meets local needs.

9- ***Support Research on AI in Speech-Language Therapy***

To explore the effectiveness, reliability and clinical outcomes of AI applications in various communication disorders and age groups, further research is needed. Additionally, future research should explore clients' and caregivers' experiences with AIST services.

10- ***Maintain Human-Centered Clinical Practice***

AI tools must be used as aids, not substitutes, for professional skills. When using AI technologies in therapy, speech-language pathologists still must make clinical decisions, demonstrate ethical responsibility, and use their clinical judgment. Adopting these recommendations could help transform the use of AI in speech-language therapy practice in Pakistan to be effective, ethical, and sustainable, ultimately enhancing the quality and accessibility of speech-language therapy services for people with communication disorders.

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