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A Survey on Challenges and Barriers to High-Tech AAC Integration Among Speech Language Pathologists in India

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Abstract

Augmentative and alternative communication (AAC) is designed to augment and substitute for traditional speech and writing for individuals with significant communication challenges serving as a critical component in the habilitation and rehabilitation of both congenital and acquired conditions. A survey-based study was conducted to investigate the challenges and barriers faced by speech language pathologists (SLPs) in India regarding the integration of high-tech AAC systems for pediatric and adult clients. A total of 155 SLPs participated and the responses were analyzed across five domains such as training-professional preparedness, accessibility-resource barriers, client-caregiver factors, institutional-systematic challenges and policy-systematic changes. Descriptive statistics and radar chart visualization were employed to profile awareness across sections. Findings revealed the highest awareness in the domain of Client and Caregiver Factors (M = 3.85, SD = 0.47) and Policy and Systemic Changes (M = 3.00, SD = 0.00), whereas

awareness was lowest in Training and Professional Preparedness (M = 1.63, SD = 0.94). Only 19.4% of SLPs reported adequate AAC training, and 80.6% acknowledged a lack of formal preparation. Conversely, universal consensus (100%) was obtained on the need for greater governmental funding, mandatory AAC training and policy-level reforms. The study underscores critical gaps in professional preparedness and systemic support for AAC in India, with implications for training programs, institutional policy and evidence-based clinical practice.

Keywords: Augmentative and Alternative communication, High-Tech AAC, Speech language pathologists, India, Pediatric and Adult clients.

INTRODUCTION

Communication is a dynamic process characterized by the active creation and attribution of meaning as well as the exchange of ideas and interactions among group members (Giffin & Patten 1976). The communication process is only finalized once the receiver transmits feedback to the sender, thereby triggering a new cycle of meaning exchange (Daniel 2013).

AAC (Augmentative and Alternative Communication) refers to an area of research, clinical and educational practice. AAC involves attempts compensate for temporary or permanent impairments, activity limitations and participation restrictions of individuals with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication (American Speech-Language-Hearing Association [ASHA] 2005).

AAC refers to a broad range of strategies, techniques and technologies that supplement or replace natural speech for individuals who experience significant difficulties in spoken communication. It encompasses both unaided systems such as manual signs, gestures, facial expressions and aided systems, which include low-technology tools such as communication boards and picture-based systems, as well as high-technology devices such as speech-generating devices (SGDs), tablet-based applications and eye-gaze systems. High-tech AAC, in particular represents a rapidly expanding domain driven by advances in computing, artificial intelligence and mobile technology. Globally, it is estimated that approximately 97 million individuals across diverse diagnostic

profiles including autism spectrum disorder (ASD), cerebral palsy, intellectual disabilities, acquired neurological conditions, and progressive neurodegenerative diseases may benefit from AAC services (Beukelman & Light 2020).

AAC interventions effectively enhance communication, social engagement, and overall quality of life, their clinical implementation is often hindered by significant systemic, professional, and environmental obstacles (Beukelman & Mirenda, 2013).

Speech-language pathologists (SLPs) play an important role in the identification, assessment, selection, implementation and monitoring of AAC systems for individuals with complex communication needs (CCN) across all age groups. AAC services provided by SLPs range from early childhood intervention to adult rehabilitation and include individuals with different communication needs and disorders. As the primary professionals involved in AAC decision-making, SLPs are expected to have knowledge of high-tech AAC systems, evidence-based intervention methods, device programming, communication partner training and interdisciplinary teamwork (American Speech-Language-Hearing Association [ASHA], 2023).

Marvin, Montano, Fusco and Gould (2003) found that SLPs in the United States reported insufficient preservice training in AAC, particularly regarding the technical customization of speech-generating devices (SGDs). Practitioners expressed difficulty managing the technical demands of AAC systems and emphasized the need for more competency-based clinical practicum experiences with individuals having complex communication needs (CCN). The study highlighted the importance of integrating more hands-on AAC training into professional preparation programs.

Costigan and Light (2010) determined that AAC training for SLPs, special educators and occupational therapists was often limited to a single course with minimal practical exposure to high-tech devices. Numerous graduates demonstrated a proficiency deficit regarding device selection, programming, linguistic organization and the implementation of communication partner training. The authors recommended broadening AAC clinical practicum opportunities and promoting interdisciplinary training across related professions.

Light and McNaughton (2012) identified a persistent gap between evidence-based AAC interventions and their implementation in routine clinical practice. Although research demonstrated the benefits of AAC for individuals across different disabilities and age groups, these practices were not consistently translated into everyday service delivery. The authors stressed the need to focus not only on developing effective AAC interventions but also on ensuring their routine clinical application.

Srinivasan, Mahalakshmi and Chitra (2015) highlighted the scarcity of AAC systems tailored to India's specific cultural and linguistic needs in an early pilot study. The researchers observed that most commercial high-tech devices were developed for English speakers offering limited support for Indian scripts, languages or culturally familiar symbols. Consequently, the study identified linguistic inaccessibility as a primary structural obstacle to the adoption of high-tech AAC within the Indian context.

Chung and Stoner (2016) identified several barriers to successful implementation in a systematic review of professional and caregiver perspectives on school-based AAC support, such as insufficient training and a lack of collaborative planning time. Participants including SLPs and teachers emphasized that effective service delivery for students using high-tech systems requires ongoing professional development and clearly defined team roles.

Donato, Wallace and Carlin (2018) found that SLPs working in early intervention settings that caregiver acceptance and limited consistency across service providers were primary barriers to AAC implementation. Other common obstacles included high equipment costs, restricted access to high-tech systems and insufficient training time. Many clinicians prioritized low-tech options over speech-generating devices indicating continued discomfort with the technical requirements of advanced systems.

Romano and Chun (2022) revealed through research that ASHA-certified SLPs have reported insufficient knowledge, high caseloads and limited time were the most common challenges. Despite reporting a moderate level of proficiency, many clinicians continue to encounter difficulties when implementing advanced high-tech systems and applying culturally responsive

frameworks in their practice. The study highlighted that these barriers have persisted for over 15 years, indicating an urgent need to address systemic gaps in professional training and support.

Narayanan and Karuppali (2023) highlighted a critical shortage of qualified speech and hearing professionals in India. The authors observed that the limited number of RCI-accredited institutions offering relevant programs significantly restricts access to specialized AAC training. Furthermore, the requirement for clinicians to practice both audiology and speech-language pathology simultaneously limits their ability to specialize in niche domains, such as high-tech AAC.

De Bortoli, Balandin, Trembath and Togher (2024) identified major challenges such as limited knowledge, stigma, resource shortages, and inappropriate device selection in a study involving diverse perspectives on high-tech AAC use among nonspeaking autistic individuals. Clinicians specifically reported difficulty keeping up with rapid technological advancements and a lack of familiarity with specific high-tech devices. Consequently, the study emphasized that coordinated collaboration between families, educators and clinicians are essential to improve outcomes and prevent device abandonment.

Philip, Geetha and Abraham (2025) conducted a scoping review of aided AAC interventions in India, finding that most research focused on children with autism spectrum disorder (ASD) while neglecting adult populations and acquired communication disabilities. Their analysis revealed that studies were primarily situated in urban clinical settings, leaving rural and semi-urban areas underrepresented. Their review identified a shortage of large-scale research and stressed the urgent requirement for AAC tools that are linguistically and culturally validated for Indian languages.

Varghese, Nair and Joseph (2025) conducted a large-scale study identifying several persistent barriers to high-tech AAC integration for non-speaking autistic individuals in India. Their research highlighted critical challenges, such as the lack of standardized symbols in regional languages, high device costs and an insufficient number of trained professionals. The authors argued that because Western-centric clinical guidelines often lack sociocultural relevance in India, specialized training and hands-on experience are essential to enhancing SLPs' proficiency and confidence in AAC service delivery.

NEED OF THE STUDY

High-tech AAC systems, such as speech-generating devices and communication apps can significantly enhance communication for pediatric and adult individuals with complex communication needs. However, the integration of these systems into clinical practice remains limited and inconsistent, particularly in developing and low-resource countries like India. A significant research gap exists as most studies on AAC awareness and implementation focus on Western populations while Indian research remains emergent. The Present study investigates the self-reported challenges and barriers faced by speech-language pathologists (SLPs) to inform evidence-based educational planning, policy reform and clinical practice development within the Indian context.

METHODOLOGY

Aim of the study

The study investigates the challenges and barriers encountered by Speech-Language Pathologists (SLPs) in integrating high-tech AAC for pediatric and adult populations in India. Specifically, it focuses on training preparedness, resource accessibility, client-caregiver factors, institutional challenges and policy-level perspectives to offer a comprehensive overview of current AAC implementation.

Participants

155 certified Speech-Language Pathologists (SLPs) currently practicing in India.

Inclusion Criteria

- Certified speech language pathologists (SLPs) practicing in India.
- SLPs with at least six months of professional clinical experience.

- Experience working with pediatric or adult populations with complex communication needs (CCN).
- Actively practicing in any clinical or educational environment, such as hospitals, schools, rehabilitation centers or private clinics.

Exclusion Criteria

- SLPs who do not hold valid professional certification.
- Professionals lacking clinical experience with pediatric or adult populations presenting with CCN.

Procedure

The study was conducted in two distinct phases.

In Phase 1, a structured questionnaire was developed to examine the challenges and barriers faced by Speech-Language Pathologists (SLPs) when integrating high-tech AAC for pediatric and adult clients in India. The tool consisted of 20 dichotomous (yes/no) items categorized into five key domains: Training and Professional Preparedness, Accessibility and Resource Barriers, Client and Caregiver Factors, Institutional and Systemic Challenges and Policy and Systemic Changes.

In Phase 2, the validated questionnaire was administered 155 qualified SLPs practicing in various professional settings across India, including hospitals, private clinics, rehabilitation centers, and academic institutions. Data was collected through direct and online methods after obtaining informed consent.

Questionnaire

Section A: Training and Professional Preparedness

1. I have received adequate formal training in assessment and implementation of High-Tech AAC systems.
   ☐ Yes ☐ No
2. My academic curriculum sufficiently prepared me for practical AAC intervention.
   ☐ Yes ☐ No
3. I feel confident selecting appropriate High-Tech AAC devices/apps for pediatric and adult clients.
   ☐ Yes ☐ No
4. Limited access to continuing education or hands-on AAC workshops affects my clinical practice.
   ☐ Yes ☐ No

Section B: Accessibility and Resource Barriers

5. The high cost of High-Tech AAC devices/apps is a major barrier for my clients.
   ☐ Yes ☐ No
6. Limited availability of AAC tools in Indian regional languages restricts effective intervention.
   ☐ Yes ☐ No
7. Lack of technical support and maintenance services discourages AAC implementation.
   ☐ Yes ☐ No
8. Limited access to devices and infrastructure in my workplace affects AAC use (e.g., devices, internet, software).
   ☐ Yes ☐ No

Section C: Client and Caregiver Factors

9. Families/caregivers have limited awareness or understanding of High-Tech AAC.
   ☐ Yes ☐ No

10. Training caregivers and teachers to consistently use AAC is challenging.
    ☐ Yes ☐ No
11. Client motivation and engagement influence long-term AAC success.
    ☐ Yes ☐ No
12. Language and cultural diversity create difficulties in customizing AAC systems.
    ☐ Yes ☐ No

Section D: Institutional and Systemic Challenges

13. Time constraints in clinical settings limit AAC assessment and intervention.
    ☐ Yes ☐ No
14. Lack of interdisciplinary collaboration affects AAC implementation.
    ☐ Yes ☐ No
15. Institutional or administrative support influences my ability to recommend High-Tech AAC.
    ☐ Yes ☐ No
16. Integrating High-Tech AAC into school, home, or workplace environments is challenging.
    ☐ Yes ☐ No
17. Integrating High-Tech AAC is more challenging with adult clients than pediatric clients.
    ☐ Yes ☐ No

Section E: Policy and Systemic Changes

18. Government funding or insurance coverage should be provided for High-Tech AAC devices.
    ☐ Yes ☐ No
19. AAC training should be strengthened in SLP academic curriculum and continuing professional development programs.
    ☐ Yes ☐ No

20. Government-supported AAC resource centers and nationwide awareness programs should be established.

☐ Yes ☐ No

Statistical Analysis

The collected data were analyzed using IBM SPSS Statistics version 27.0. Descriptive statistics including frequency, percentage, mean, and standard deviation were used to summarize the responses obtained from the participants. The responses were categorized into five sections: (A) Training and Professional Preparedness, (B) Accessibility and Resource Barriers, (C) Client and Caregiver Factors, (D) Institutional and Systemic Challenges, and (E) Policy and Systemic Changes. Radar charts were generated using Microsoft Excel to visualize the awareness profile across the five sections. A significance level of $p < 0.05$ was considered statistically significant for all statistical analyses.

RESULT

The aim of the study was to investigate the challenges and barriers encountered by Speech-Language Pathologists (SLPs) in integrating high-tech AAC for pediatric and adult populations in India and the obtained result are discussed below.

Table 1:

Shows frequency and percentage distribution of Participants according to training and professional preparedness.

		Frequency	Percentage
Q1	Yes	30	19.4
	No	125	80.6
Q2	Yes	92	59.4
	No	63	40.6

Q3	Yes	37	23.9
	No	118	76.1
Q4	Yes	94	60.6
	No	61	39.4

From table 1, it can be inferred concluded that majority of SLPs lacked formal training 80.6% and confidence in implementing high-tech AAC systems 76.1%. However, 59.4% a majority of respondents reported that their academic coursework provided sufficient preparation for the practical application of AAC interventions and 60.6% were willing to undergo training if opportunities were provided. This indicates a significant gap in AAC training and professional preparedness despite moderate awareness and willingness for further education.

Table 2:

Shows frequency and percentage distribution of Participants according to Accessibility and Resource Barriers.

		Frequency	Percentage
Q5	Yes	132	85.2
	No	23	14.8
Q6	Yes	140	90.3
	No	15	9.7
Q7	Yes	114	73.5
	No	41	26.5
Q8	Yes	105	67.7
	No	50	32.3

From table 2, it can be observed that 85.2% identified high device cost as a major barrier and 90.3% noted limited availability of AAC devices in clinical and educational settings. Additionally, 73.5% reported challenges related to insufficient technical support and 67.7% indicated limited

funding and insurance coverage further hindered AAC implementation. These results indicate that SLPs are widely aware of the structural and financial barriers that limit AAC access in India.

Table 3:

Shows frequency and percentage distribution of Participants according to Client and Caregiver Factors

		Frequency	Percentage
Q9	Yes	151	97.4
	No	4	2.6
Q10	Yes	152	98.1
	No	3	1.9
Q11	Yes	155	100.0
	No	0	0.0
Q12	Yes	140	90.3
	No	15	9.7

From table 3, it can be observed that 97.4% recognized limited caregiver knowledge and training as a barrier, while 98.1% acknowledged the impact of client motivation and acceptance on AAC use. Significantly, 100% of respondents agreed that caregiver involvement and support are critical for sustainable AAC integration and 90.3% identified sociocultural attitudes and stigma as relevant barriers. These findings indicate that SLPs in India are highly aware of the role of client and caregiver dynamics in determining AAC outcomes.

Table 4:

Shows frequency and percentage distribution of Participants according to Institutional and Systemic Challenges

		Frequency	Percentage
Q13	Yes	86	55.5

	No	69	44.5
Q14	Yes	130	83.9
	No	25	16.1
Q15	Yes	61	39.4
	No	94	60.6
Q16	Yes	150	96.8
	No	5	3.2
Q17	Yes	105	67.7
	No	50	32.3

From table 4, it can be concluded that 55.5% of respondents acknowledged that time constraints in clinical settings limit AAC assessment and intervention. Furthermore, 83.9% of respondents agreed that a lack of interdisciplinary collaboration negatively affects AAC implementation and 60.6% of respondents did not agree that institutional or administrative support influences their ability to recommend High-Tech AAC. Significantly, 96.8% respondents find integrating high-tech AAC into school, home or workplace environment to be particularly challenging. Additionally, 67.7% found integrating High-Tech AAC more challenging with adult clients than pediatric clients.

Table 5:

Shows frequency and percentage distribution of Participants according to policy and systemic changes.

		Frequency	Percentage
Q18	Yes	155	100.0
	No	0	0.0
Q19	Yes	155	100.0
	No	0	0.0
Q20	Yes	155	100.0

	No	0	0.0

Table 5 it reveals the absolute agreement among the surveyed Indian SLPs underscores a unified advocacy for comprehensive systemic reform. The data reflects a collective demand for infrastructure development to facilitate high-tech AAC implementation nationwide. Specifically, all respondents (100%) agreed on the critical need for three key initiatives: the establishment of standardized policy frameworks, the provision of government financial backing, and the mandate for structured professional education.

Table 6:

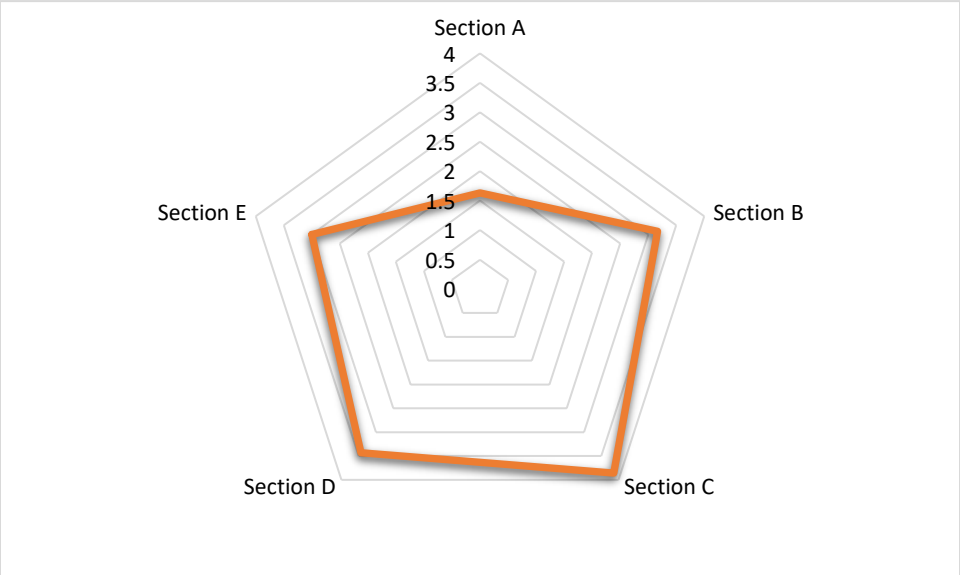
Shows the Mean and Standard Deviation values for each section.

Section	**N**	**Mean**	**Standard Deviation**
Section A	155	1.632258	0.94676
Section B	155	3.167742	1.236981
Section C	155	3.858065	0.475896
Section D	155	3.432258	0.837586
Section E	155	3	0

Table 6 outlines the mean and standard deviation values across the five surveyed domains. Section C (Client and Caregiver Factors) yielded the highest composite score (M = 3.8, SD = 0.47), followed closely by Section D (Institutional and Systemic Challenges; M = 3.43, SD = 0.83) and Section B (Accessibility and Resource Barriers; M = 3.16, SD = 1.23). Section E (Policy and Systemic Changes) recorded a central mean score (M = 3.00, SD = 0.00), where the zero standard deviation indicates absolute consensus among all 155 respondents. Conversely, Section A (Training and Professional Preparedness) registered the lowest composite score (M = 1.63, SD = 0.95), highlighting it as the area with the lowest perceived preparedness among the surveyed SLPs.

Figure 1:

Shows the overall awareness profile across the five sections.



This radar chart illustrated the overall awareness profile across the five investigated domains with the markers representing the mean scores for each section. Section C (Client and Caregiver Factors) extended toward the outer perimeter of the chart, signifying the highest level of perceived awareness. Conversely, Section A (Training and Professional Preparedness) exhibited a sharp inward dip toward the center, illustrating a pronounced gap in preparedness and awareness relative to the other domains.

DISCUSSION

High-tech augmentative and alternative AAC uses electronic tools ranging from specialized equipment to mainstream smart devices to facilitate communication. By merging hardware and

software, these modern systems support users primarily by translating their thoughts into spoken language through speech generating sentences (Elsahar et al., 2019).

The present study investigated the level of awareness among speech -language pathologists in India regarding the challenges and barriers to the integration of high-tech AAC systems for both pediatric and adult client populations. A structured survey questionnaire was administered to 155 SLPs across India. The findings revealed a profound deficit in formal education, indicating that many clinicians lack confidence in implementing AAC systems in practice. Participants demonstrated a positive attitude toward professional development and expressed willingness to engage in AAC training opportunities. Significant financial and resource-related barriers, including the high cost of devices, limited availability and insufficient technical support continue to limit AAC accessibility in India. Practitioners exhibited their highest level of insight regarding client and family factors strongly emphasizing the active caregiver participation, client motivation and sociocultural attitudes are pivotal to successful AAC adoption.

The findings highlighted that several systematic and institutional challenges affecting high tech AAC integration in India, including inadequate institutional infrastructure, lack of AAC-specific guidelines, limited professional development opportunities and insufficient government support. However, interdisciplinary collaboration was perceived to be comparatively better in some clinical settings, suggesting the presence of collaborative practices within multidisciplinary teams. Participants emphasized the need for standardized AAC policies, government supported funding and structured professional training programme. Overall, the study highlights that improving AAC integration in India requires coordinated efforts involving policy reform, institutional support, professional training, and increased awareness among caregivers and society.

SUMMARY AND CONCLUSION

High-tech AAC systems are important interventions for individuals with complex communication needs. However, their integration in India remains limited. The present study examined the awareness of Indian Speech-Language Pathologists regarding the challenges and barriers to high-tech AAC integration for pediatric and adult clients. A survey was conducted among SLPs across

India using a questionnaire covering training and professional preparedness, accessibility and resource barriers, client and caregiver factors, institutional challenges, and policy-related issues. The findings showed that awareness was highest in relation to client and caregiver factors, particularly the importance of caregiver involvement, client motivation and sociocultural influences on AAC use. Participants also demonstrated strong awareness of policy and systemic needs including the importance of standardized AAC policies, government funding and professional training programme.

The study further identified several barriers affecting high-tech AAC integration, such as limited device availability, inadequate government support, lack of institutional guidelines and insufficient professional development opportunities. The lowest level of awareness was observed in the area of training and professional preparedness indicating limited formal high -tech AAC training and reduced clinical confidence among SLPs. Overall, the findings suggest that although Indian SLPs recognize the importance of high-tech AAC and its related challenges, there is a need for improved training, stronger institutional support, and effective policy reforms to enhance high-tech AAC services and ensure better accessibility for individuals with complex communication needs in India.

Limitations of the study

- The study did not separately analyze SLPs working with pediatric and adult populations which may have overlooked population-specific differences.
- The use of Yes/No questions may not have fully elicited the detailed experiences and perceptions of SLPs regarding AAC barriers.

Future Directions

- Further studies should examine the impact of training programme and include caregiver and client perspectives to better understand high-tech AAC implementation challenges.
- Research should include larger, more diverse samples from various regions and clinical settings in India to increase the generalizability of the findings.

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