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Review

Teaching and applying telepractice for hearing and balance disorders in Africa in the COVID-19 era and beyond

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Abstract

Background The COVID-19 pandemic necessitated widespread adoption of telepractice to ensure the continuity of healthcare services, including those for individuals with hearing and balance disorders. In Africa, where access to specialized healthcare services is often limited, telepractice emerged as a potential solution. However, the implementation of telepractice in African contexts faces unique challenges.

Aim This narrative review aims to synthesize the available literature on the teaching and application of telepractice for hearing and balance disorders in the African context following the COVID-19 pandemic. The review explores barriers and facilitators to telepractice implementation and identifies gaps in knowledge to inform future research, policy, and clinical practice.

Methods A narrative review approach was adopted to provide a broad and interpretive synthesis of the literature. Thirteen relevant publications were identified, focusing on the period between January 2020 to current. Publications were selected based on their contribution to the understanding of telepractice in managing hearing and balance disorders, with key themes analysed to explore recurring patterns and insights. Saturation was reached when no new themes emerged during the review process.

Results Six key themes emerged from the analysis: (1) accessibility and reach of telepractice; (2) technological infrastructure and digital literacy; (3) training and capacity building; (4) barriers in resource-limited settings; (5) facilitators for adoption of telepractice; and (6) sustainability and future of telepractice in Africa. These themes reveal that while telepractice has significantly improved accessibility to audiology and balance services, particularly in remote areas, its implementation is hindered by poor internet connectivity, limited digital literacy, and inadequate infrastructure.

Conclusion Telepractice holds considerable potential to address healthcare access challenges in Africa, especially for hearing and balance disorders. However, systemic barriers related to infrastructure, resources, and training need to be addressed to ensure long-term success. Future policies should focus on enhancing technological infrastructure, providing affordable internet access, and integrating telepractice into healthcare training programmes. Further research is necessary to explore context-specific solutions and optimize the delivery of telepractice services in Africa.

Keywords Telepractice · Hearing disorders · Balance disorders · Africa · COVID-19 · Digital health · Tele-audiology · Healthcare accessibility · Digital literacy · Preventive audiology

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1 Introduction

The COVID-19 pandemic has significantly disrupted healthcare delivery worldwide, necessitating rapid adaptations and innovations to ensure continued patient care [1]. Telepractice, the provision of health services remotely using telecommunications technology, emerged as a critical response to the restrictions imposed by the pandemic [2–9]. This shift was particularly crucial for vulnerable populations, including individuals with hearing and balance disorders, who require consistent and specialized care. In Africa, where healthcare infrastructure varies widely and access to specialized services can be limited, the adoption of telepractice has presented both opportunities and challenges [4, 10, 11].

In audiology, telepractice has transformed the way services are delivered, providing an alternative to traditional in-person visits and ensuring continuity of care during the pandemic [12–15]. Audiologists have leveraged telepractice to perform a range of services, including hearing assessments, hearing aid fittings, auditory rehabilitation, and patient counselling [16–19]. This mode of service delivery has proven beneficial in overcoming geographical barriers, reducing travel costs for patients, and increasing accessibility to audiological care in remote and underserved areas [20–22]. However, the implementation of telepractice in audiology within the African context faces unique challenges such as limited internet connectivity, lack of technological infrastructure, and varying levels of digital literacy among patients and healthcare providers [4, 11, 23, 24]. Understanding these challenges and identifying successful strategies and interventions are crucial for optimizing telepractice in audiology and ensuring equitable access to care for individuals with hearing and balance disorders across the continent.

Despite the growing global interest in telepractice, there is limited comprehensive knowledge about its implementation, efficacy, and impact in the African context, especially for hearing and balance disorders [4, 10, 25]. This gap in knowledge is significant because Africa's unique socio-economic, cultural, and technological landscapes influence the adoption and success of telehealth interventions [9, 26, 27]. In many African countries, socio-economic barriers such as poverty, limited healthcare funding, and unequal distribution of healthcare resources can hinder the widespread adoption of telepractice [28]. Additionally, technological barriers such as inconsistent internet connectivity, limited access to advanced telecommunication devices, and inadequate digital infrastructure further complicate the implementation of telehealth services [24].

Cultural and linguistic diversity across the continent adds another layer of complexity [8, 11, 29, 30]. Africa is home to thousands of languages and numerous cultural practices that affect health communication and patient engagement. Telepractice models must be tailored to accommodate this diversity, ensuring that services are linguistically accessible and culturally sensitive. Facilitators for successful telepractice implementation include community involvement, culturally appropriate health education, and the use of local languages in telehealth communication [24]. Additionally, leveraging mobile health (mHealth) platforms, which are more prevalent and accessible in many African regions, can enhance the reach and effectiveness of telepractice services [31, 32].

Understanding these barriers and facilitators specific to the African context can guide the development of more effective and contextually appropriate telepractice models to enhance service delivery to vulnerable populations such as the populations with hearing and balance disorders in Africa. Populations with hearing and balance disorders in the African context can be considered particularly vulnerable due to a confluence of factors that exacerbate their health disparities and access to care. Firstly, the limited availability of specialized healthcare professionals, such as audiologists and otologists, poses a significant barrier to receiving timely and appropriate care [33–36]. Many African countries face a severe shortage of these specialists, leading to long wait times and extensive travel for patients seeking diagnosis and treatment.

Secondly, socio-economic challenges, including widespread poverty and inadequate healthcare funding, further compound the vulnerability of these populations [24, 37]. Limited financial resources often mean that individuals cannot afford the necessary interventions, such as hearing aids or balance therapy, which are critical for managing their conditions. Additionally, healthcare systems in many African countries are under-resourced and overburdened, struggling to meet the needs of the general population, let alone those requiring specialized care [38–40].

Furthermore, the linguistic and cultural diversity of the African continent presents unique challenges in healthcare delivery [41–44]. Communication barriers can arise when healthcare providers do not speak the local language or are not culturally attuned to the patients' needs [45–47]. This is particularly pertinent for individuals with hearing disorders, who may already face difficulties in communication. Ensuring that telepractice services are linguistically accessible and culturally sensitive is crucial for effective patient engagement and care.

Technological barriers also play a significant role in the vulnerability of these populations. Inconsistent internet connectivity, limited access to digital devices, and varying levels of digital literacy can impede the successful

implementation of telepractice. Without reliable technology, patients may not be able to participate in telehealth appointments or access remote monitoring and management tools, further limiting their access to necessary care.

Lastly, the stigma associated with hearing and balance disorders in some African communities can deter individuals from seeking help. Cultural beliefs and misconceptions about these conditions can lead to social isolation and reduced quality of life for affected individuals. Addressing these cultural stigmas through education and community engagement is essential for improving the acceptance and utilization of telepractice services [48, 49].

By recognizing and addressing these factors, healthcare providers and policymakers can better support vulnerable populations with hearing and balance disorders in Africa, ensuring they receive equitable and effective care. This scoping review aimed to map the existing literature on telepractice for hearing and balance disorders in Africa following the COVID-19 pandemic. It sought to identify the scope of research, highlight trends, identify existing knowledge gaps, and highlight areas for future research and development. By doing so, this review provides valuable insights for clinicians, policymakers, and researchers to enhance telepractice services and ensure equitable access to care for individuals with hearing and balance disorders across the continent—an arguable positive consequence of COVID-19 for the population of focus in this study.

2 Methodology

This paper employed a narrative review methodology to explore the teaching and application of telepractice for populations with hearing and balance disorders in the African context following the COVID-19 pandemic. A narrative review allows for a comprehensive synthesis of diverse studies, offering a broader interpretation and critique of the literature [50]. This approach is well-suited to the research question, as it provides an in-depth exploration of a topic with varied evidence, rather than a strictly systematic synthesis.

2.1 Search strategy and data sources

The search strategy was designed to be transparent and comprehensive without compromising feasibility. The literature search was conducted in September 2024 across multiple electronic databases, including CINAHL, EBSCOHost, MEDLINE, ProQuest, PubMed, Scopus, African Journals Online (AJOL) and ScienceDirect. The search was iterative and included peer-reviewed journal articles, chapters, and relevant commentaries published in English between January 2020 to current, ensuring the inclusion of studies conducted during and after the COVID-19 pandemic. Key search terms used were: "telepractice," "telehealth," "hearing disorders," "balance disorders," "teaching", "COVID-19," and "Africa." No strict inclusion or exclusion criteria were applied to allow for the inclusion of a wide range of studies addressing the phenomenon from different angles. Eligible studies had to have some focus on the teaching and/or application of telepractice for hearing and balance disorders within the African context.

The initial literature search yielded 132 publications. As the narrative review process is iterative, additional searching was halted once saturation was reached—when no new themes or insights emerged from the included literature. At this point, 119 publications were excluded for the following reasons:

- They did not focus on the use of technological advancements in audiology education or clinical practice during the COVID-19 pandemic.
- They primarily addressed traditional face-to-face teaching methods without integrating technology.
- They lacked relevance to the South African or low- and middle-income country context.

Ultimately, 13 papers were included in the review, providing a sufficient and comprehensive synthesis of the key themes and insights relevant to the research question.

2.2 Study selection

Relevant studies were identified based on their contribution to the understanding of telepractice within the African context. The selection included empirical studies, reviews, case studies, and reports on the teaching and application of telepractice for hearing and balance disorders. Seminal publications that provided key insights into telepractice's

challenges and opportunities post-COVID-19 were also included. Studies were selected iteratively as part of an evolving process, ensuring that the scope remained flexible in line with the narrative review approach.

2.3 Data extraction

Following Peters et al. [51] guidelines, data were charted in alignment with the review's objectives, using a standardized data extraction form. A total of 18 studies were included in the review and are summarized in Table 1. The table includes the following extracted data:

- Researcher(s) and year of publication
- Title of the study
- Country and setting of the study.
- Population characteristics (e.g., age, gender, type of disorder).
- Description of telepractice intervention (teaching and/or application of telepractice reported).
- Conclusions and recommendations.
- Key findings.
- Barriers and facilitators to telepractice implementation.

2.4 Data analysis

The analysis followed a thematic approach, where key themes and patterns across the literature were identified, synthesized, and critically discussed [51, 52]. This allowed for an exploration of the varying contexts, challenges, and opportunities of telepractice in different African countries, with a focus on the implications for hearing and balance disorders. The study considered the socio-cultural and economic diversity across Africa to provide contextually relevant insights. Saturation in this narrative review was reached when additional literature searches no longer yielded new themes or insights relevant to the research question [50]. The iterative process of selecting and analysing studies allowed for a comprehensive synthesis of the available evidence, ensuring that key themes were adequately explored and represented in the final analysis.

2.5 Reflexivity and interpretation

Throughout the review process, reflexivity was maintained, recognizing that the interpretation of findings is shaped by the authors' perspectives and the context in which the review was conducted. The iterative nature of the review allowed for the inclusion of a broad range of studies, and decisions regarding which literature to include were made with the understanding that the goal was to provide a meaningful synthesis rather than an exhaustive account.

2.6 Quality assessment

Although the primary aim of a narrative review is not to assess the quality of the included studies, a basic quality check was performed to ensure the credibility and reliability of the findings. Studies were evaluated for methodological rigor and clarity of reporting [53].

2.7 Ethical considerations

As this study involves the review of existing literature, there were no direct ethical concerns. This narrative review adhered to all ethical standards pertinent to studies that do not involve direct contact with human or animal participants. Ethical considerations included reflexivity and informed subjectivity, ensuring that the researcher maintained awareness of their biases and perspectives throughout the study [54]. Additionally, audience-appropriate transparency was upheld, meaning that the methods and findings were communicated clearly and honestly to suit the intended audience. Purposefully informed selective inclusivity was also practiced, as the selection of studies was conducted with careful consideration to ensure relevance and comprehensiveness [55, 56].

Table 1 Summary of Evidence on Telepractice for Hearing and Balance Disorders in Africa Post-COVID-19

Researcher(s) and Year	Title of Study	Country/Setting	Population Characteristics	Telepractice Intervention	Key Findings	Conclusions & Recommendations	Barriers & Facilitators
Khoza-Shangase et al. (2022)	The impact of COVID-19 on speech–language and hearing professions in low-and middle-income countries: Challenges and opportunities explored	South Africa	Audiologists, speech-language therapists in LMICs	Application of telepractice for continued care during COVID-19 in low-resource settings	Identified gaps in resources and technology hindering telepractice. Highlighted opportunities for continuity of care	Recommendations include more investment in telehealth infrastructure and training for healthcare professionals in LMICs	Barriers: Resource constraints, limited technology. Facilitators: Pandemic-driven push to adopt telepractice, particularly for continuity of care
Govender et al. (2022)	Bridging the access gap: The telepractice experience of speech therapists and audiologists at a public healthcare facility in South Africa	South Africa (public healthcare)	Audiologists, speech therapists	Utilization of telepractice for managing communication disorders in a public healthcare setting	Improved access to care for remote populations. Increased efficiency in managing caseloads with telepractice interventions	Calls for structured training for professionals in telepractice, with an emphasis on its use in resource-limited public healthcare	Barriers: Digital literacy among patients, poor internet access. Facilitators: Professional willingness to adapt, institutional support for telepractice
Masuku et al. (2023)	The Use of Telepractice to Support Teachers in Facilitating Learning for Children with Communication Disorders: A South African Proposal	South Africa (educational context)	Teachers, children with communication disorders	Implementation of telepractice to support teachers in managing students with hearing and communication disorders	Demonstrated positive impacts on children's educational outcomes with teacher support via telepractice	Encourages integration of telepractice within the education system to facilitate inclusive learning environments for communication challenges	Barriers: Lack of training for teachers in using telepractice, inadequate access to digital tools. Facilitators: Increased need for telepractice during the pandemic, driven by educational demands
Khoza-Shangase (2022)	In pursuit of increasing the application of tele-audiology in South Africa: COVID-19 puts on the alert for patient site facilitator training	South Africa	Patients requiring audiology services	Tele-audiology for geographically distant and underserved populations	Identified a critical need for patient-site facilitator training to enable effective tele-audiology service delivery in low-resource settings	Advocates for systematic training of site facilitators as essential to expanding the reach and success of tele-audiology services	Barriers: Shortage of trained facilitators, inadequate technological infrastructure. Facilitators: Demand for remote services during COVID-19, recognition of tele-audiology's value in maintaining care

Table 1 (continued)

Researcher(s) and Year	Title of Study	Country/Setting	Population Characteristics	Telepractice Intervention	Key Findings	Conclusions & Recommendations	Barriers & Facilitators
Maluleke and Khoza-Shangase (2023)	Embracing videoconferencing interview applications beyond COVID-19: Scoping review-guided implications for family-centered services in SA	South Africa (family-centred care)	Families of individuals with communication disorders	Application of telepractice, especially videoconferencing, to provide family-centred speech and audiology services	Videoconferencing enabled continuity of care but posed challenges in environments with poor connectivity or low digital literacy	Recommendations include a focus on improving digital literacy and infrastructural investments to support widespread telepractice use	Barriers: Internet connectivity, digital literacy gaps in families. Facilitators: Increased acceptance of video-based interventions for family-centred care
Sebothoma et al. (2022)	The use of telepractice in assessment of middle ear function in adults living with HIV during the COVID-19 pandemic	South Africa	Adults with HIV, middle ear dysfunction	Application of telepractice in the assessment of middle ear function through remote audiology tools	Telepractice offered an efficient alternative to in-person assessments, with positive outcomes in managing middle ear issues	Advocates for the continued use of telepractice in HIV care settings, expanding its use beyond pandemic needs	Barriers: Internet access and availability of tele-audiology equipment in rural areas. Facilitators: Convenience and reduced need for in-person appointments, especially for immune-compromised populations
Watermeyer et al. (2022)	Experiences of a pediatric speech-language teletherapy practical at a South African university training site during COVID-19: A qualitative study	South Africa (paediatric setting)	Paediatric speech-language patients	Teletherapy for speech-language therapy, delivered via virtual platforms during university clinical training	Students and clinicians faced challenges in adapting to teletherapy, but it allowed for the continuation of services during COVID-19	Teletherapy is a viable complement to in-person services, especially for training purposes and in times of restricted access	Barriers: Digital adaptation challenges, technological hurdles for students and patients. Facilitators: Acceptance of teletherapy for educational continuity and patient care
Eubank et al. (2022)	Community-based assessment and rehabilitation of hearing loss: A scoping review	Global (focus on community-based models, including Africa)	Community health workers, individuals with hearing loss	Community-based telepractice interventions for hearing loss management	Telepractice models involving community health workers improved access to hearing care, particularly in low-resource settings	Suggests integrating community health workers into tele-audiology models to bridge gaps in access to care	Barriers: Inadequate community training, resource limitations in rural areas. Facilitators: Leveraging community-based workers to deliver hearing care through telehealth

Table 1 (continued)

Researcher(s) and Year	Title of Study	Country/Setting	Population Characteristics	Telepractice Intervention	Key Findings	Conclusions & Recommendations	Barriers & Facilitators
Biggs et al. (2022)	Preparedness training and support for augmentative and alternative communication telepractice during the COVID-19 pandemic	United States (global implications)	Professionals in augmentative and alternative communication (AAC) settings	Telepractice for augmentative and alternative communication services, training of professionals for remote AAC delivery	Highlighted a need for better preparedness training for AAC professionals, with telepractice playing a crucial role in continuity	Recommendations for expanding AAC telepractice with robust training and support for professionals to enhance service delivery	Barriers: Lack of preparedness for remote AAC services, technological limitations. Facilitators: Increased adoption of telepractice driven by pandemic conditions
Jesudass et al. (2024)	Needs and readiness to use telepractice for identification and rehabilitation of children with hearing and speech-language disorders: perceptions of public sector care providers in South India	South India	Children with hearing and speech-language disorders, public sector care providers	Application of telepractice for the identification and rehabilitation of children with hearing and communication disorders	Public sector care providers were willing to use telepractice but needed better training and infrastructure to implement it effectively	Calls for further development of training programmes and infrastructure to support telepractice in the public sector	Barriers: Insufficient telepractice training, lack of adequate resources. Facilitators: High readiness among care providers to adopt telepractice post-pandemic
Bhamjee et al. (2022)	Perceptions of telehealth services for hearing loss in South Africa's public healthcare system	South Africa (public healthcare)	Patients and healthcare providers in public healthcare	Telepractice services for hearing loss, focusing on public sector perceptions	Telehealth is seen as a valuable tool for managing hearing loss, but challenges include limited access to technology	Telehealth in the public healthcare system can improve access, but there is a need for better infrastructure and provider training	Barriers: Lack of technology, limited digital literacy among patients. Facilitators: Provider willingness and positive perceptions of telehealth by patients
Khoza-Shangase, Moroe and Neille (2021)	Speech-language pathology and audiology in South Africa: Clinical training and service in the era of COVID-19	South Africa (clinical training)	Audiology and speech-language pathology students and patients	Use of telepractice for clinical training of students during COVID-19	Telepractice enabled continuation of training and patient care, but challenges included lack of adequate infrastructure	Recommends integrating telepractice into clinical training curricula and addressing infrastructure gaps in future policies	Barriers: Infrastructure issues, lack of student readiness for digital platforms. Facilitators: Flexibility of telepractice allowed continuation of services during the pandemic

Table 1 (continued)

Researcher(s) and Year	Title of Study	Country/Setting	Population Characteristics	Telepractice Intervention	Key Findings	Conclusions & Recommendations	Barriers & Facilitators
Khoza-Shangase and Sebothoma (2022)	Tele-audiology and preventive audiology: A capacity versus demand challenge imperative in South Africa	South Africa	Patients in need of preventive audiology services, healthcare providers	Use of tele-audiology to meet preventive care needs in a context of high demand and low capacity	Tele-audiology has potential to alleviate capacity issues in preventive audiology, but resource limitations persist	Calls for strategic planning to address the capacity-versus-demand challenge in South African audiology using tele-audiology	Barriers: Limited resources and technological infrastructure. Facilitators: Growing recognition of the value of preventive audiology, especially through telehealth solutions
Madahana et al. (2022)	A proposed artificial intelligence-based real-time speech-to-text to sign language translator for South African official languages for the COVID-19 era and beyond	South Africa (COVID-19 response)	Deaf and hard-of-hearing individuals, speech-language pathology and audiology providers	Development of an AI-based real-time translator to facilitate communication for hearing-impaired individuals during the pandemic	AI-based technology holds potential for improving communication access for hearing-impaired populations	Recommends the further development and testing of AI-based solutions to address communication barriers for the Deaf community	Barriers: Limited technological readiness and funding for AI-based solutions. Facilitators: Increased demand for communication solutions due to the pandemic and beyond
Madahana et al. (2024)	Development of an artificial intelligence-based occupational noise-induced hearing loss early warning system for mine workers	South Africa (mining sector)	Mine workers at risk of occupational noise-induced hearing loss	AI-based early warning system for detecting and preventing occupational noise-induced hearing loss	AI-based systems could revolutionize hearing loss prevention in high-risk occupational settings like mining	Advocates for implementing AI-based early warning systems to reduce occupational hearing loss, with special attention to high-risk industries	Barriers: Technological challenges in deploying AI systems in rural mining areas. Facilitators: Strong need for preventive solutions in high-risk industries like mining
Mothemela, Ramma and Swanepoel (2024)	Update on the state of audiology in South Africa	South Africa (state of audiology)	Audiologists, hearing-impaired individuals	Broad overview of the state of audiology in South Africa, including telepractice components	Tele-audiology has expanded access to services, but there are still major gaps in service delivery across the country	Calls for improved access to audiology services through tele-audiology, focusing on underserved and rural populations	Barriers: Service delivery gaps, uneven distribution of audiology services across rural and urban areas. Facilitators: Tele-audiology's potential to bridge the service gap

Table 1 (continued)

Researcher(s) and Year	Title of Study	Country/Setting	Population Characteristics	Telepractice Intervention	Key Findings	Conclusions & Recommendations	Barriers & Facilitators
Nagdee et al. (2022)	Simulations as a mode of clinical training in healthcare professions: A scoping review to guide planning in speech-language pathology and audiology during the COVID-19 pandemic and beyond	South Africa (healthcare education)	Healthcare students in speech-language pathology and audiology	Use of simulation-based learning in clinical training as a response to limitations posed by the pandemic	Simulation-based learning is a valuable tool for clinical education, especially in situations where face-to-face interaction is restricted	Recommends increased use of simulation in clinical education to prepare students for real-world scenarios when in-person training is limited	Barriers: Technological limitations in setting up high-quality simulations. Facilitators: Acceptance of simulation-based learning by students and educators as a viable alternative to face-to-face learning during the pandemic
Townsend, Mars and Scott (2020)	The HPCSA's telemedicine guidance during COVID-19: a review	South Africa (HPCSA telemedicine policy)	Healthcare providers across South Africa	Review of the Health Professions Council of South Africa's telemedicine guidance during the pandemic	The HPCSA's guidance provided essential direction for telemedicine adoption but needs ongoing updates to address emerging challenges	Calls for continuous review and adaptation of telemedicine guidelines to reflect ongoing technological advancements and changing healthcare needs	Barriers: Initial resistance to telemedicine adoption and outdated regulatory frameworks. Facilitators: COVID-19 spurred rapid updates to guidance, making telemedicine a more accepted practice in healthcare

3 Results

The evidence included in this review comprises a range of study types, including empirical studies, reviews, and case reports, reflecting the diversity of research approaches used to investigate telepractice for hearing and balance disorders in the African context. Most of the studies were conducted in South Africa, which is a hub for research on telepractice in audiology and speech-language pathology in Africa. The settings varied widely, encompassing public healthcare facilities [10, 57], educational institutions [4], and high-risk occupational sectors such as mining [58]. The populations studied were equally diverse, ranging from healthcare professionals (e.g., audiologists, speech-language pathologists) to patients with hearing and balance disorders, including those with communication impairments and those at risk of occupational hearing loss. Several studies focused on vulnerable groups such as children with communication disorders [11] and mine workers at risk of occupational noise-induced hearing loss [58]. These populations highlight the varied applications of telepractice in different healthcare and educational contexts, from managing paediatric communication disorders to preventing hearing loss in occupational health settings.

The studies revealed a broad application of telepractice interventions, including tele-audiology for remote hearing assessments [59], AI-based solutions for real-time speech-to-text translation [60], and the use of videoconferencing for clinical training and family-centred services [9]. These interventions were implemented in response to the COVID-19 pandemic, underscoring the need for flexible, remote care models during periods of restricted face-to-face interaction. The types of evidence reflect not only the growing interest in telepractice but also the need for context-specific solutions in Africa, where infrastructure limitations and resource constraints pose significant challenges. The variation in study designs, settings, and populations highlights the adaptability of telepractice across different environments, while also pointing to the need for tailored interventions that address the unique socio-economic and technological landscapes of African countries.

The thematic analysis of the data in Table 1 and the article summaries identified six key themes that address the research question: "What evidence has been published on the teaching and/or application of telepractice following COVID-19 in populations with hearing and balance disorders in the African context?": (1) accessibility and reach of telepractice; (2) technological infrastructure and digital literacy; (3) training and capacity building; (4) barriers in resource-limited settings; (5) facilitators for adoption of telepractice; and (6) sustainability and future of telepractice in Africa.

3.1 Theme 1: Accessibility and reach of telepractice

A recurring theme across the studies is the ability of telepractice to enhance accessibility to care, particularly for individuals in rural and underserved areas. Telepractice has allowed healthcare providers to reach patients who would otherwise face significant geographical or transportation barriers, providing continuity of care during and after the COVID-19 pandemic. The studies by Govender et al. [10] and Khoza-Shangase [61] emphasize the expanded reach of telepractice in managing hearing and balance disorders, especially for populations located far from urban healthcare centres. This improvement in access is critical in Africa, where healthcare services are often concentrated in major cities, leaving rural populations underserved. By utilizing telepractice, audiologists and speech-language therapists have been able to provide essential services such as hearing assessments, hearing aid fittings, and auditory rehabilitation [60]. The increased accessibility highlights the need for governments and healthcare providers to further invest in telehealth solutions as a permanent complement to traditional care, rather than a temporary response to the pandemic. Policies that support infrastructure development in rural areas will be crucial for ensuring continued accessibility [62].

3.2 Theme 2: Technological infrastructure and digital literacy

The technological limitations of telepractice were identified as a major barrier within the African context. Poor internet connectivity, the cost of data, and limited digital literacy were key challenges for both healthcare providers and patients. Studies such as Maluleke and Khoza-Shangase [9], Nagdee et al. [63], and Sebothoma et al. [59] emphasize that without reliable internet access, the effectiveness of telepractice is diminished. The lack of stable internet and the high cost of data make telepractice difficult to implement on a broad scale, particularly in rural areas. Furthermore, digital literacy—both among healthcare providers and patients—affects the success of telepractice interventions [9, 10, 57]. These challenges highlight the need for interventions at multiple levels, including improving technological infrastructure and ensuring

that both healthcare professionals and patients have the necessary skills to effectively use telehealth platforms. Initiatives that provide affordable internet and mobile data access will directly impact the viability of telepractice in the long term. This may require public–private partnerships (PPPs) which have an important role to play towards improving healthcare infrastructure and expanding the reach of digital tools as part of digital healthcare expansion [64, 65]. Specifically, within the South African context, for example, PPPs with telecommunication companies such as Vodacom and MTN with public healthcare institutions for network access and affordable data is one such key collaborative initiative.

3.3 Theme 3: Training and capacity building

Training and capacity building were frequently cited as necessary for successful implementation of telepractice. Healthcare providers require specific training in telehealth technology, and patient-site facilitators are essential to ensure smooth telepractice interactions [63, 66]. Studies such as Khoza-Shangase [61], Nagdee et al. [63]; Khoza-Shangase, Moroe and Neille [4]; and Masuku et al. [11] discuss the critical need for training programmes aimed at healthcare providers, specifically audiologists and speech-language pathologists. The success of tele-audiology, in particular, depends on trained facilitators who can assist with technical setup, communication, and problem-solving during virtual consultations [61]. Similarly, Watermeyer et al. [29] highlighted that training was required to adapt clinicians and students to teletherapy platforms during their paediatric speech-language practical sessions. These findings suggest that training and capacity building are key areas of focus if telepractice is to be scaled up successfully. Healthcare systems should integrate telepractice into curricula for audiologists and speech therapists and provide ongoing support to clinicians adapting to digital platforms. Training programmes for patient-site facilitators in low-resource settings will be especially important for extending the reach of telepractice services.

3.4 Theme 4: Barriers in resource-limited settings

The resource constraints faced by low-and middle-income countries (LMICs) in Africa present significant barriers to the implementation of telepractice. These include a lack of infrastructure, equipment, and financial resources. Studies such as Khoza-Shangase et al. [6] and Sebothoma et al. [59] highlight the resource-related barriers to effective telepractice, including insufficient access to tele-audiology equipment, reliable internet, and the technological tools needed for telehealth interventions. Resource-limited settings also face difficulties in accessing hearing aids and diagnostic tools that are necessary for remote assessments and rehabilitation [66]. Addressing resource limitations will require partnerships between governments, international health organizations, and technology companies to ensure that the necessary infrastructure is put in place. Additionally, innovative solutions, such as community health workers assisting with telepractice, as part of task-shifting initiatives, may help bridge the gap in resource-limited settings.

3.5 Theme 5: Facilitators for adoption of telepractice

Several studies identified factors that facilitate the adoption of telepractice, including government support, professional willingness to adapt, and the urgency created by the COVID-19 pandemic. Studies like Govender et al. [10] show that when public healthcare systems support telehealth, the adoption of telepractice is smoother. The pandemic's urgency also accelerated the adoption of digital solutions, and many healthcare providers demonstrated adaptability and a willingness to learn new technologies, as seen in Bhamjee et al. [57], Masuku et al. [11] and Khoza-Shangase et al. [8]. Moving forward, the temporary facilitators of telepractice adoption during the pandemic (such as the urgency of COVID-19) should be formalized into long-term strategies. Continued government support, incentives for healthcare professionals to adopt telehealth solutions, and integration of telepractice into healthcare policies will be critical for sustained success.

3.6 Theme 6: Sustainability and future of telepractice in Africa

The sustainability of telepractice beyond the pandemic is a key concern, with many studies questioning how telepractice can be fully integrated into the African healthcare system in a post-COVID world. The future of telepractice hinges on the development of supportive policies, the continued expansion of digital health technologies, and efforts to overcome barriers related to infrastructure and training. Khoza-Shangase et al. [4] recommended integrating telepractice into clinical training curricula and addressing infrastructure gaps in future policies. Eubank et al. [67] emphasized the importance of community-based telepractice models to extend services in rural areas, while Biggs et al. [5] suggested

that preparedness training will be vital to ensure the long-term sustainability of telepractice services. To ensure the sustainability of telepractice, African countries must develop comprehensive policies that incorporate telehealth into the broader healthcare framework. Investments in technology, training, and community-based healthcare delivery models will be essential for embedding telepractice as a core part of healthcare services.

4 Conclusion and implications

The thematic analysis reveals that while telepractice has offered a vital solution for maintaining continuity of care during the COVID-19 pandemic, its implementation in Africa faces significant hurdles related to infrastructure, training, and resource limitations. However, the potential of telepractice to expand access to care, particularly for vulnerable populations in remote and underserved areas, is profound. The pandemic has magnified existing disparities in healthcare access, and telepractice represents an opportunity to address these inequities, especially for individuals with hearing and balance disorders who often fall through the cracks in traditional healthcare systems.

In the context of the special issue theme, *"COVID-19 Pandemic and Vulnerable Populations in the African Countries,"* this narrative review underscores the heightened vulnerability of individuals with hearing and balance disorders, who already experience challenges in accessing specialized care. These challenges have been exacerbated by the pandemic, with lockdowns and restricted movement further limiting access to in-person services. Telepractice thus emerges as a potentially transformative tool, not only during the pandemic but also as part of a long-term strategy to reach vulnerable populations.

Several policy, research and clinical implications are highlighted. As far as policy implications are concerned, governments must take proactive steps to prioritize telehealth policies that address the specific needs of vulnerable populations in Africa. This includes investing in the technological infrastructure required to support telepractice, such as expanding broadband access and ensuring affordable internet, especially in rural and underserved areas. Additionally, digital literacy campaigns tailored to these populations will be essential in ensuring that both patients and healthcare providers can effectively engage with telepractice technologies. Policies should also promote equitable access to telepractice, considering the socio-economic and geographic barriers that disproportionately affect vulnerable groups. Furthermore, regulatory frameworks need to be established to integrate telepractice into mainstream healthcare, ensuring that it is recognized and reimbursed as part of standard care. As far as research implications go, research should focus on how telepractice can be adapted to diverse African contexts, recognizing the vast socio-cultural, linguistic, and economic differences across the continent. Further exploration of community-based telepractice models is needed, particularly those that leverage task-shifting strategies, such as involving community health workers in the delivery of telehealth services. These models could significantly alleviate the healthcare worker shortages that often plague this context. Pilot programmes are essential to evaluate the effectiveness of these community-driven approaches and to explore context-specific barriers such as digital literacy, gender disparities in technology use, and cultural attitudes toward remote care. As far as clinical implications are concerned, clinically, the shift to telepractice requires a rethinking of service delivery models to ensure that telepractice complements in-person care. A hybrid model of care—combining telepractice with periodic in-person consultations—may offer the most flexible solution, particularly for managing chronic conditions like hearing loss and balance disorders, which require ongoing monitoring and intervention. Healthcare providers need sustained support in the form of training and capacity-building programmes to familiarize them with telepractice technologies and to ensure that they can offer high-quality, patient-centred care remotely. For vulnerable populations, particularly those with limited digital access or literacy, healthcare professionals must also develop culturally sensitive communication strategies to enhance patient engagement and adherence to treatment plans.

There are also broader implications for vulnerable populations. Telepractice presents a rare opportunity to reduce healthcare disparities for vulnerable populations that have been disproportionately impacted by the pandemic. However, realizing this potential requires an intersectional approach that addresses the multifaceted barriers to care—technological, social, and economic. By embedding telepractice into healthcare policy and practice, governments and healthcare providers can better serve populations that have historically been marginalized in traditional healthcare systems. This shift not only supports the continuity of care post-COVID but also strengthens healthcare resilience for future pandemics or crises, ensuring that vulnerable populations are not left behind.

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Data availability Data supporting the findings of this study are available within the paper.

Declarations

Ethics approval and consent to participate As this study involves the review of existing literature, there were no direct ethical concerns. This narrative review adhered to all ethical standards pertinent to studies that do not involve direct contact with human or animal participants.

Consent for publication Not applicable.

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