Review Article

Multidisciplinary telehealth interventions for autistic children in sub-Saharan Africa: challenges and recommendations

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Abstract

History of autism is plagued by misconceptions and distortions and it is mostly attributed to spiritual causes. A comprehensive literature search was conducted to identify studies of telehealth interventions in the management of autism in various countries, and related challenges in Sub-Saharan Africa. There were several obstacles in adopting multidisciplinary telehealth interventions (MTI) which include poor internet, epileptic power supply, cultural beliefs, and lack of political will. This commentary compiles historical misconceptions, MTI which could be scaled up to meet the health-care needs of autistic children in Sub-Saharan Africa and the challenges that follow. Furthermore, it presents some recommendations for integrating telemedicine into the healthcare system. This commentary advocates the need for incorporating telehealth in autism spectrum disorder (ASD) management to improve care accessibility in sub-Saharan Africa through a multidisciplinary telehealth approach involving health practitioners, caregivers, teachers, psychologists, behavioural therapists, policy-makers, information technology (IT) specialists, web and applications developers, and government officials. User-friendly, low-cost telehealth models such as Applied behavior analysis (ABA), Face your fears (FYF) model, Collaborative model for promoting competence and success (COMPASS), ImPACT program, Joint attention, symbolic play, engagement, and regulation (JASPER), and Early start Denver model (ESDM) improve health outcomes in various countries and may be reworked for implementation in Sub-Saharan Africa. Development of appropriate telehealth infrastructure, increasing education and training of healthcare professionals and patients, and the need for government support and funding would improve accessibility and practice of telehealth interventions.

Keywords: Autism, Telehealth interventions, Multidisciplinary, Sub-Saharan Africa, Challenges

INTRODUCTION

The World Health Organization has recognized the lack of healthcare services to support autistic individuals as a global public health concern [1]. A large number of individuals with various neurodevelopmental disabilities reside in Sub-Saharan Africa as a result of shortages in disability-specific services, and programs for an increasing number of children under five years [2]. According to the United Nations International Children's Education Fund [3], the African continent is constantly going through an unprecedented demographic shift in children population size, and it has been projected to reach one billion in the next three decades, and a further increase in less than 18 years population by two-thirds. In low-and-middle-income countries (LMIC) especially Sub-Saharan Africa where 95 % of autistic people live, healthcare services are relatively scarce [4-5]. Given that the largest percentage of children worldwide reside in Sub-Saharan Africa, this demographic shift highlights the necessity of creating workable, long-lasting, and contextually anchored early interventions for autistic children that may be incorporated into current care systems. Persistent systemic issues in the healthcare supply chain make it extremely difficult to meet the demands of families in LMIC nations who look after young autistic children. Even though 95 % of children worldwide reside in LMICs, barely 10 % of research on mental health and much less on neurodevelopmental disorders has been carried out [5-6]. Although the principle of task-sharing has been widely promoted as a potential solution to meet evolving demands, lack of trained professionals, coupled with poor array of dearth specialist services has not met the imminent needs of families residing in LMIC.

Evidence-based programs and interventions for neurodevelopmental conditions that have been studied and developed in high-income and developed countries are challenging with just a handful having access to such services [7]. Caregiver-related challenges such as acceptance, culture-related challenges, well-being, educational exposure, and sense of parenting have severely hampered its implementation in Sub-Saharan Africa. Since children with autism spectrum disorder (ASD) show different communication, interaction, and learning patterns from other children, a multidisciplinary, and comprehensive team approach involving many specialists, such as neurologists, pediatricians, and speech and occupational therapists is required [8,9]. Furthermore, environmental factors, including diet, allergens, and psychosocial elements such as caregiver stress, family coping mechanisms, sensory overload, influence, and medical challenges associated with autism are major considerations in treatment, emphasizing the need for multidisciplinary care [10].

Telehealth, as a subset of e-health, refers to the use of technology to facilitate virtual interactions in the provision of health-related services, including dissemination of health-related facts, preventative measures, monitoring of medical care as well as provision of remote training using technology-based training platforms [11]. Autism spectrum disorder (ASD) accounts for 0.3 % of the global disease burden, and as such telehealth offers an avenue to achieve sustainable development goals in promoting health and mental well-being for all ages [12]. The World Health Organization (WHO) has identified challenges in accessing healthcare services regarding autism as well as the urgent demand to strengthen the capacity of the healthcare system to deliver specific healthcare requirements to those with ASD [13]. It is imperative to identify the corresponding obstacles and proffer solutions to optimize telehealth interventions in delivering multidisciplinary treatment for ASD in Sub-Saharan Africa. This commentary explored the historical context of interventions for autism alongside current interventions to provide care, followed by telehealth-based recommendations to fill in the gaps of currently existing interventions and address the various challenges of ASD care in Sub-Saharan Africa.

Historical and current contextual challenges in autism interventions

The history of autism is plagued by misconceptions and distortions. Early studies showed that autism might be culturally specific, potentially making ASD rare in regions like Sub-Saharan Africa [14]. In the 1970s, psychiatrist Lotter identified nine autistic children in hospitals across six African countries. Thereafter, reports from Kenya, Zimbabwe, Nigeria, and Ghana emerged [15]. While autism exhibits genetic heterogeneity, there are no valid biomarkers or biological tests for diagnosis [14]. Scarcity of research has limited academic understanding of how ASD is present in Africans. The prevailing view is that the supernatural (a significant component of most traditional African cultures) is the root cause of autism, and is not attributed to biological reasons. Across many African cultures, a shared belief exists that every occurrence has a purpose and blame is assigned to entities, such as evil forces, or individuals, often implicating family members for the undesirable condition. As a result, these perceptions significantly impact how people with autism and

their families navigate their community with many families experiencing rejection from wider society [16].

Cultural beliefs, limited knowledge about neurodevelopmental disorders, and reliance on traditional healers as medical authorities on ASD have cumulatively shaped historical interventions. Traditional healing methods may not adequately address the unique healthcare needs of ASD and may additionally delay cultural acceptability of evidence-based interventions. Treatment involves telehealth-based interventions such as Applied Behavior Analysis (ABA) and Social Skills Training (SST). Recent studies emphasize the critical need for contextually relevant and culturally appropriate tools [17]. However, availability of healthcare services for individuals with autism is hampered by healthcare inequities, especially in underprivileged communities, due to disparities in accessing evidence-based interventions, further compounded by financial constraints.

MODELS OF TELEHEALTH INTERVENTIONS FOR ASD

Various models of telehealth interventions for autism have been proposed and tested on a small scale in different parts of the world. In this section, several of these are outlined as possible models to be implemented in Sub-Saharan Africa. As parents are critical in aiding professionals by providing key information on their child to aid management, training them to mediate telehealth interventions may enable consistent implementation of therapeutic techniques. There have been an array of telehealth interventions ranging from structured to natural or developmental interventions which have been applied in various countries. Although some are developmental, they provide the framework for incorporating such interventions in Sub-Saharan Africa and minimizing the challenges they present.

Applied behaviour analysis (ABA)

Interventions for children with ASD are diverse, but behaviorally-based teaching is the most evidence-based method for optimizing outcomes [18]. Applied behavior analysis (ABA) focuses on creating socially significant change in children's lives [19]. The ABA focuses on Early Intensive Behavioral Intervention (EIBI) to mitigate behavioral deficits [20]. In EIBI services, the procedures involve reducing symptoms and problem behaviors associated with ASD and replacing those problem behaviors with appropriate skills in language, socialization, play,

cognition, academics, motor development, and daily living skills [21]. Although strong evidence supports the positive impact of ABA-based material given through in-person parenting classes; these sessions are demanding on resources and necessitate in-person instruction from a behavior specialist. In addition, families frequently encounter additional obstacles while trying to access services, like a dearth of nearby providers or lengthy waitlists for admission to nearby treatment centers. As a result, recent studies have investigated other alternatives to make these services readily available in a more cost and time-efficient way [21]. One such is the integration of telehealth as part of the health delivery model. This provides information about health via the Internet in the form of readings, synchronous video conferences, or modules produced by qualified experts. For example, one study [22] used telehealth in the form of video calls to provide information on strategies to reduce behaviour problems and the result revealed improved functional outcomes. Similarly, Heitzman-Powell *et al* [23] used potentially affordable virtual and e-learning program training option that teaches parents of children about ABA principles and procedures. In sub-Saharan Africa, this approach is still in its infancy and some countries have not integrated it into existing health systems, while others have significant positive results. With improved literacy and development of the educational sector in the region, this model may be highly beneficial and easily integrated into the health systems of Sub-Saharan African countries.

Face your fears (FYF) model

This model comprises various components including parental component, core cognitive behaviour therapy, and social skills. This model significantly requires active caregiver/parenting participation with the goal of improving teens' social skills development [24]. Social skills training employs role-playing, modeling and feedback to teach and reinforce social skills in a group format [25]. Thus, by creating a system that facilitates an efficient parent-child interface, clinical outcomes may be improved. A recent study incorporated the use of an Apple iPod touch or device to create an efficient parent-child interface with significantly improved check-ins throughout treatment [26]. However, there were challenges, which are still very pronounced in Sub-Saharan Africa. Technological difficulties, cost, poor technical know-how, and illiteracy associated with these gadgets are widespread in Sub-Saharan. A persistent gender gap in digital technology, a lack of accessible and affordable connectivity, inadequate regulatory and policy

environments, underdeveloped digital infrastructure, and a lack of skills for digitally enabled industries are some of the major obstacles to digital development in Sub-Saharan Africa (SSA). Nonetheless, the area has made significant progress toward digital transformation in the past ten years, with hundreds of millions of people now having internet access and making effective use of a wide range of digital services, including platforms for online education and mobile payments. The percentage of web users in Sub-Saharan Africa increased from 19 % in 2016 to 36 % in 2021, due to a variety of World Bank initiatives. The World Bank's flagship Digital Economy for Africa (DE4A) initiative supports the ambition of ensuring that every individual, business, and government in Africa is digitally enabled by 2030 [27]. As a result, most of the challenges currently encountered arise from parents' and caregivers' acceptance. Caregivers may be disinterested in ameliorating the behavioural deficits arising from the prevailing view that the root cause of ASD is spiritual, and therefore not attributed to biological reasons [16].

Collaborative model for promoting competence and success (COMPASS)

Most children with autism rely on schools as their primary source of intervention, yet research has suggested that teachers rarely use evidence-based practices [28]. The COMPASS model based on telehealth was developed to meet the demand for better learning results. The COMPASS model shows a significant reduction in parenting stress, child behaviour problems, and improved parenting competence [29]. Parents were actively engaged in group and individual sessions at either a university or a regional telehealth center using a book to review learning differences specific to ASD, evidence-based approaches for managing problem behaviors, and information about parent stress and coping strategies [30]. Thus, to achieve this, a certain level of literacy is required. In the last decade, literacy levels in several parts of Sub-Saharan Africa have improved due to technological advancement allowing for distance learning and strong political will to provide education on health issues through community engagement. This creates a feasible environment for the COMPASS model to thrive.

ImPACT online

The ImPACT program focuses on parental education to improve play skills, social connection, and joint attention. This strategy is predicated on the idea that parent education is

applicable and affordable, fosters better generalization, preserves skills, and boosts parental optimism while lowering stress levels. The objective is to improve core areas of social communication including social engagement, language, imitation, and play through a handful of interventions [31]. The ImPACT online website incorporates video clips, a written manual, a self-check quiz, short interactive exercises, and an assignment. This intervention improves parents' engagement and satisfaction when assisted by a therapist [32]. However, it requires an array of technical expertise in handling online surveys and training. In Ethiopia, poor internet connectivity (low speed and poor connectivity) and an unstable electricity power supply have hampered the implementation of this telehealth intervention for ASD children [33]. With many households resorting to green energy and faster internet interface, this model may be beneficial in Sub-Saharan Africa.

Joint attention, symbolic play, engagement, and regulation (JASPER)

The JASPER is a treatment approach based on a combination of developmental and behavioral principles. This intervention model uses naturalistic strategies to increase the rate and complexity of social communication, which includes parents and teachers. Senior trainers completed training in JASPER implementation and coaching while interventionists were trained by senior trainers through workshops and practice with weekly feedback. After this training, each interventionist conducted an intervention with two children for another 12 weeks while receiving weekly support via either face-to-face or remote meetings which significantly improved communication outcomes [34]. For face-to-face interviews, the distance-related barrier has been overcome in Sub-Saharan Africa due to the availability of distance learning services and interfaces for interviews. However, poor network connectivity in very remote areas would make practicability difficult.

Early start Denver model (ESDM)

The versatility of the ESDM makes it more practicable in various Sub-Saharan settings. It is employed in homes, clinics or schools justifying a multidisciplinary role. It is a behavioral therapy for children with autism between the ages of 12-48 months. It depends on the principles of ABA effective for children with a wide range of learning styles and abilities. The ESDM helps children make progress in their social skills, language skills, and cognitive skills. Children who have significant learning challenges benefit just

as much as those without learning challenges. Therapy is provided in both group and one-on-one settings [35]. This model is multidisciplinary engaging parents/caregivers, tech-inclined professionals and a robust data system for detailing a child's community intervention with weekly coaching and access to an ESDM website [36].

CHALLENGES OF INTEGRATING MTI FOR ASD IN SUB-SAHARAN AFRICA

Sub-Saharan Africa (SSA) lags in incorporating telehealth in healthcare management since pre-COVID-19, and these are still prevailing in the post-COVID-19 era [37].

Technological barriers

These barriers relate to information and communication inadequacies prevalent in most countries in Sub-Saharan Africa (Table 1).

Financial barriers

Quality healthcare delivery is intricately linked with reliable financial support. There are four main financial obstacles to the successful adoption of telemedicine: a small medical budget; high ICT and telemedicine infrastructure costs; high import and telecommunications tariffs; and high electrical supply costs. Since most patients are financially constrained, the likelihood of expanding telemedicine services is low, hence adoption and usage become difficult [45]. Furthermore, healthcare professionals are reluctant to use technology in diagnosis, treatment, and consultations due to the financial unsustainability in some countries.

Cultural diversity and language differences

Social and cultural dynamics potentially influence patients' decision to use telemedicine systems [46]. For example, the socio-cultural differences between collaborators (professionals) and local experts were a major challenge in Mali [47]. Resistance to change and language differences are major barriers to the implementation of telemedicine [45]. Patients and their perceptions of the relevance of technology in treating illnesses posed a challenge since it breeds resistance to change [48]. Illiterate families of patients find it challenging to seek professional assistance due to language differences as they may only speak in their native/cultural language. The cultural beliefs that the root cause of ASD is spiritual, and therefore not attributed to biological reasons would limit telehealth practices [16].

Professional and patient barrier

Previous studies reported that healthcare professionals perceived telemedicine practice as a threat to their profession [49], and possibly may lead to a lack of control over patient management [50]. This is because medical practitioners confer with other specialists in order to reach an agreement regarding appropriate diagnosis, treatment, and management. Thus, the perceived threat to autonomy hinders the effective use of the technology [51]. Healthcare professionals have cited concerns such as the possibility of sub-optimal location for assessment, not being able to see behind the camera limiting the view obtained in light of possible repetitive movements of the patient being assessed, poor internet connection to assess gait, posture, responsivity, and reciprocity during social interaction all of which are significant for diagnosis [52]. Since technical knowledge and skills for telemedicine are important, limited expertise may still negatively influence professionals' and patients' confidence and adoption of the technology in the management of autism [45]. As autism is a lifelong condition, there are long-term implications as those who do not receive care services and therapies needed will likely encounter persistent difficulty in their day-to-day functioning.

Table 1: Technological barriers affecting telehealth interventions

Country of study	Main challenges
Ethiopia	Poor quality internet connectivity (low speed and poor connectivity) and an unstable electricity power supply [32-33, 38-39].
Mali, Burkina Faso, Ghana and Nigeria	Research suggests that poor internet connectivity impact negatively on the quality of consultations [40].
Rwanda, Uganda, Kenya	Lack of adequate telemedicine and Information and Communication Technology infrastructure [41-44].

RECOMMENDATIONS

Increase budgetary allocations

Most of the healthcare sectors in Sub-Saharan Africa are limited in their ability to financially support the adoption and implementation of telemedicine technology. As a result, it is expedient to increase budgetary allocation to support telemedicine implementation, as well as collaborations between public and private health sectors to widen funding sources for telemedicine projects [45].

Improving telecommunication infrastructure

By establishing suitable telecommunications infrastructure and fostering collaborative partnerships, it is possible to formulate, translate, and culturally tailor best global practice guidelines for diagnosing and treating children with ASD across diverse regions in Sub-Saharan Africa. Gladstone *et al* [52] modified a developmental assessment tool for children in Malawi, ensuring the materials and play scenarios were culturally familiar to them. In Sub-Saharan Africa, having access to technology at home is crucial for receiving healthcare services; hence, governments and other stakeholders must offer sufficient financial support to advance equality and lessen socioeconomic gaps.

Improving the quality-of-service delivery

Healthcare providers should incorporate a real-time network model in addition to the store-and-forward practice, especially in remote areas. This will promote patients' confidence in the system [45]. Health decision-makers are urged to maintain a healthy balance between the use of telemedicine and the personal touch, which is primarily valued in Sub-Saharan African societies. In addition, expanding education and training could be taken into consideration to enhance patients' and practitioners' knowledge and abilities. It will motivate more patients, physicians, and nurses to adopt telemedicine practices.

Collaborative policies development

This commentary suggested that while telemedicine policy remained relatively the same across the continent, access and usage remained varied. Healthcare professionals and government policymakers must create implementation techniques that align with the demands of each nation (such as cultural norms and governance structures) if they hope to keep telemedicine relevant. Providing a comprehensive e-policy framework that regulates the adoption and implementation of telemedicine

in Sub-Saharan Africa is highly recommended. Furthermore, the development of excellent collaborations, balanced stakeholder interests, broader usage of reasonably priced telemedicine services, technical assistance, and ongoing funding will all benefit from the right legal framework and policy environment. This commentary also recommends establishing strict protocols to monitor and evaluate telemedicine practices. When parents or caregivers are not involved in the process, it creates a disconnect between the treatment room and what goes on in the child's home, such that the professionals are not aware of practice successes and failures [53]. As a result, the children may not achieve as much progress and could even regress. This necessitates guardian and caregiver active involvement in MTI for autism in Sub-Saharan Africa.

Addressing ethical concerns

Various ethical implications must be carefully considered in telehealth-mediated care. Informed consent is necessary for ethical care, ensuring patients are properly informed on the risks and benefits associated with remote therapy. To minimize ethical issue of inaccurate diagnoses due to insufficiency in available data for clinical decision-making, training of health professionals to deliver interventions via telehealth is strongly recommended [54]. It is noteworthy that while some telehealth services in other parts of the world have utilized commercially available platforms such as WeChat and Zoom, there is a paucity of reported strategies to address potential privacy [55]. Given that telehealth systems frequently collect, store, and transmit protected health information (PHI), any security breach could pose harm to patients and is an amplified concern in low- and middle-income countries (LMIC) where patient digital literacy tends to be lower, increasing vulnerability to privacy risks. To mitigate this issue, the development of a virtual platform that safeguards patient privacy and confidentiality, and is culturally appropriate is recommended.

CONCLUSION

Several global models, including ABA, FYF, COMPASS, IMPACT, JASPER, and ESDM improve health outcomes in various countries utilizing user-friendly, low-cost platforms and may be reworked for implementation in sub-Saharan Africa. Development of appropriate telehealth infrastructure, increasing education and training of healthcare professionals and patients, and the need for government support and funding would improve accessibility and practice of telehealth

interventions. Therefore, integration of telehealth in existing healthcare systems is a possible solution to combat issues of healthcare disparities among ASD patients.

DECLARATIONS

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

The authors declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by them.

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