Review article:

The Use of Telerehabilitation Across Rehabilitation Services in Saudi Arabia: A Scoping Review

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Abstract:

Telerehabilitation is a way to provide remote rehabilitation services to people who are in need in various regions of Saudi Arabia. This review aimed to explore the status of telerehabilitation services in Saudi Arabia. Six databases (PubMed, EMBASE, CINAHL, Scopus, Web of Sciences, and Google Scholar) were searched. Studies that reported data on telerehabilitation services (Physiotherapy, Occupational, and Speech-language therapy and Prosthetics and orthotic) in Saudi Arabia were eligible for inclusion. Abstracts, non-human studies, reviews, case reports, and studies that aim to develop or validate outcome measures for telerehabilitation were excluded. Three hundred seventy-nine references were identified, of which 21 met eligibility criteria – including a total of (n=3796) participants from diverse groups (healthy participants, patients, and healthcare providers). A number of studies provided data on the effectiveness of telerehabilitation in specific conditions (stuttering, musculoskeletal, and vestibular conditions). 46% of clinicians reported awareness of telerehabilitation, but 19.9% of them used telerehabilitation. Patients reported 82% satisfaction, with 62.5% favouring a mix model of care. Clinical efficacy includes a 14.22% improvement in 6-minute walk test scores for pulmonary rehabilitation ($p = 0.001$), 36% pain reduction in musculoskeletal rehabilitation ($p < 0.001$), and 89% reliability in pediatric stuttering evaluation. This review showed that telerehabilitation seems to be a suitable way to provide remote rehabilitation services for different conditions. However, to gain maximum benefits from telerehabilitation services, the barriers and challenges (e.g., technology, policy and lack of training) should be further explored and considered.

Keywords:

Telerehabilitation, Rehabilitation Services, Remote Rehabilitation, Saudi Arabia

Introduction:

Rehabilitation has a critical role in facilitating independent life for individuals with medical conditions[1,2]. Rehabilitation enables individuals with disability to engage in daily activities, work, education, recreational activities, and meaningful roles in life – enhancing their quality of life[3,4]. Rehabilitation services including physical therapy, occupational therapy, and speech and language therapy are important to restore physical function, reduce symptoms, and enhance quality of life[3]. The importance of rehabilitation services makes it critical to be accessible to those who are in need in the society. Despite this, the accessibility to rehabilitation services remains challenging, particularly for individuals who live in rural areas, those with limited transportation, or whose cultural context influences their engagement with healthcare. With the advancement of modern technologies and telecommunication, healthcare services can be delivered remotely to individuals who are in need, unable to access in-person therapy, or affected by crises such as the COVID-19 global pandemic[5].

Recently, telerehabilitation — a rehabilitation service that is provided online via digital platforms — has become a novel way to bring therapy and support into people's homes[8]. Telerehabilitation aligns with a global trend to use digital health to make healthcare services more accessible and resilient[9,10]. In Saudi Arabia, a country with vast landscapes and rapidly growing cities, telerehabilitation can be used to ensure that everyone can reach necessary rehabilitation services. This is because Saudi Arabia has committed to building a future with high-quality healthcare services that should be accessible to the population despite where they live [7]. Previous reviews indicate that telerehabilitation can be effective in providing essential care for those with chronic conditions (e.g., neurological and musculoskeletal disorders) and for post-surgical conditions when in-person visits are not possible or are not necessary[11]. Other research has investigated barriers and facilitators to implementation, including technical infrastructure limitations, digital literacy, and clinician resistance[12,13]. Previous research has also explored key stakeholder perspectives (patients and clinicians) about telerehabilitation and its adoption, highlighting the role of patient satisfaction, provider training, and institutional support in successful uptake[13,14,15,16,17,18]. However, most of this evidence is drawn from international contexts, and there remains a need to synthesize findings specific to Saudi Arabia.

Despite the potentials of telerehabilitation, it is still relatively new in Saudi Arabia, and there is much to understand about how

should be facilitated [7]. Previous original research has explored its use in specific fields such as physical therapy, occupational therapy, and speech therapy[13,14,15,19, 20,21]. Understanding the current state of telerehabilitation services in Saudi Arabia – including its usability, effectiveness, and quality of care – is essential for identifying existing gaps and informing future recommendations for service improvement through this review.

This review aims to explore the current state of telerehabilitation services in Saudi Arabia and identify the telerehabilitation services used (such as physical therapy and occupational therapy). It also seeks to evaluate the effectiveness of these services and explore key stakeholders (e.g., patients and clinicians) perspectives about these serveries, and provide insights into the facilitators and barriers to their implementations in the context of Saudi Arabia.

Methods:

The Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Review (PRISMA-ScR) guided this review [22].

Search strategy:

This review was conducted by searching six electronic databases (PubMed, EMBASE, CINAHL Via EBSCOhost, Scopus, Web of Sciences and Google Scholar) on the basis of the inclusion criteria from inception to October 2024. No date or language restrictions were used. Three sets of strings were used. The first string of terms related to the Kingdom of Saudi Arabia and its synonyms. The second string represented the rehabilitation services that could be provided (Physiotherapy, Occupational Therapy, Prosthetics orthotic and Therapy and Speech-language therapy) and their possible terminologies. The third set is related to telerehabilitation and its possible terminologies such as telemedicine and remote rehabilitation. Terms within each entry string were separated by 'OR', and each of the four strings was combined with 'AND'. See Appendix A for the list of search terms for each database.

Search Strategy of the six electronic databases (PubMed, EMBASE, CINAHL Via EBSCOhost, Scopus, Web of Sciences and Google scholar)

Search Terms:

Database	Search terms	Results
PubMed	Telerehabilitation" [MeSH] OR "Telemedicine" [MeSH] OR "Telehealth" OR")) (""Teletherapy" OR "Remote rehabilitation" OR "Telehealth Service AND ((((("Physiotherapy" OR "Occupational Therapy" [MeSH] OR "Rehabilitation Services") OR (Prosthetics orthotic Therapy [MeSH])) OR (Speech-language therapy ((((([MeSH])) OR (Physical Therapy [MeSH AND ((Kingdom of Saudi Arabia [MeSH]) OR ("Saudi Arabia" [MeSH] OR "KSA" (("OR "Gulf Countries" OR "Ministry of Health" OR " Ministry	30

EMBASE	telerehabilitation'/exp OR 'telerehabilitation' OR 'telemedicine'/exp OR 'tele-' medicine' OR 'telehealth'/exp OR 'telehealth' OR 'teletherapy'/exp OR 'teletheraR 'py' OR 'remote rehabilitation'/exp OR 'remote rehabilitation' OR 'telehealth service AND (((((physiotherapy OR occupational) AND therapy OR rehabilitation) AND services OR prosthetics) AND orthotic AND therapy OR 'speech language') AND therapy OR physical) AND therapy AND (((kingdom AND of AND saudi AND arabia OR saudi) AND arabia OR ksa OR gulf) AND countries OR ministry) AND of AND health OR minI istry	70
CINAHL Via EBSCO-host	TX ("Telerehabilitation" OR "Telemedicine" OR "Telehealth" OR "Teletherapy" OR (""Remote rehabilitation" OR "Telehealth Service TX ("Physiotherapy" OR "Occupational Therapy" OR "Rehabilitation Services" OR (Prosthetics orthotic Therapy OR Speech-language therapy OR Physical Therapy TX (Kingdom of Saudi Arabia OR "Saudi Arabia" OR "KSA" OR "Gulf Countries" ("OR "Ministry of Health" OR " Ministry	21
Scopus	Telerehabilitation" OR "Telemedicine" OR "Telehealth" OR "Teletherapy" OR "Re-" mote rehabilitation" OR "Telehealth Service" AND "Physiotherapy" OR "Occupational Therapy" OR "Rehabilitation Services" OR Prosthetics orthotic Therapy OR Speech-language therapy OR Physical Therapy AND Kingdom of Saudi Arabia OR "Saudi Arabia" OR "KSA" OR "Gulf Countries" OR "Ministry of Health" OR " Min-"istry	1
Web of Science	ALL=Telerehabilitation OR Telemedicine OR Telehealth OR Teletherapy OR Remote rehabilitation OR Telehealth Service AND ALL=Physiotherapy OR "Occupational Therapy OR Rehabilitation Services OR Prosthetics orthotic Therapy OR Speech-language therapy OR Physical Therapy AND ALL=Kingdom of Saudi Arabia OR Saudi Arabia OR KSA OR Gulf Countries OR Ministry of Health OR Ministry	55
Google scholar	telerehabilitation in Saudi Arabia	202
	:Total	379
	After duplicates (178) removal	201

Study selection:

Database searches were conducted by the author. All references were imported into Endnote where duplicates were removed. Screening of title, abstract and full text were completed by two independent reviewers within Covidence Systematic Review software (Veritas Health Innovation, Melbourne, Australia). Any disagreements were resolved by discussions in a meeting. Reference lists of eligible articles were manually checked to identify any other relevant articles.

Eligibility criteria:

All studies (qualitative and quantitative) that reported data on telerehabilitation services (Physiotherapy, Occupational Therapy, Prosthetics orthotic and Therapy and Speech-language therapy) in Saudi Arabia were eligible for inclusion. Also, studies that were published in English or Arabic were eligible for inclusion.

We excluded conference abstracts, non-human studies, reviews and case reports. We also excluded studies that did not report any specific data to Saudi Arabia. Studies without telerehabilitation focus on Saudi Arabia and that aim to develop or validate outcome measures for telerehabilitation were excluded.

Data extraction:

We extracted data using a standardised data extraction sheet. Two reviewers independently extracted data using a standardised data extraction sheet. Any discrepancies in data extraction were resolved by regular discussions. Data extracted included: study characteristics (author, country and year of publication), study design, and sample characteristics. We also extracted any data and outcomes regarding the attitude, awareness, prevalence rate, satisfaction with, adherence to, implementation, stakeholder perceptions, effectiveness and knowledge of telerehabilitation in Saudi Arabia.

Results:

Search results:

The electronic search produced 379 articles from six databases with unique 201 articles after removal of duplicates. A total of 67 references were eligible for full-text screening of which 21 studies met the eligibility criteria in this study (Figure 1).

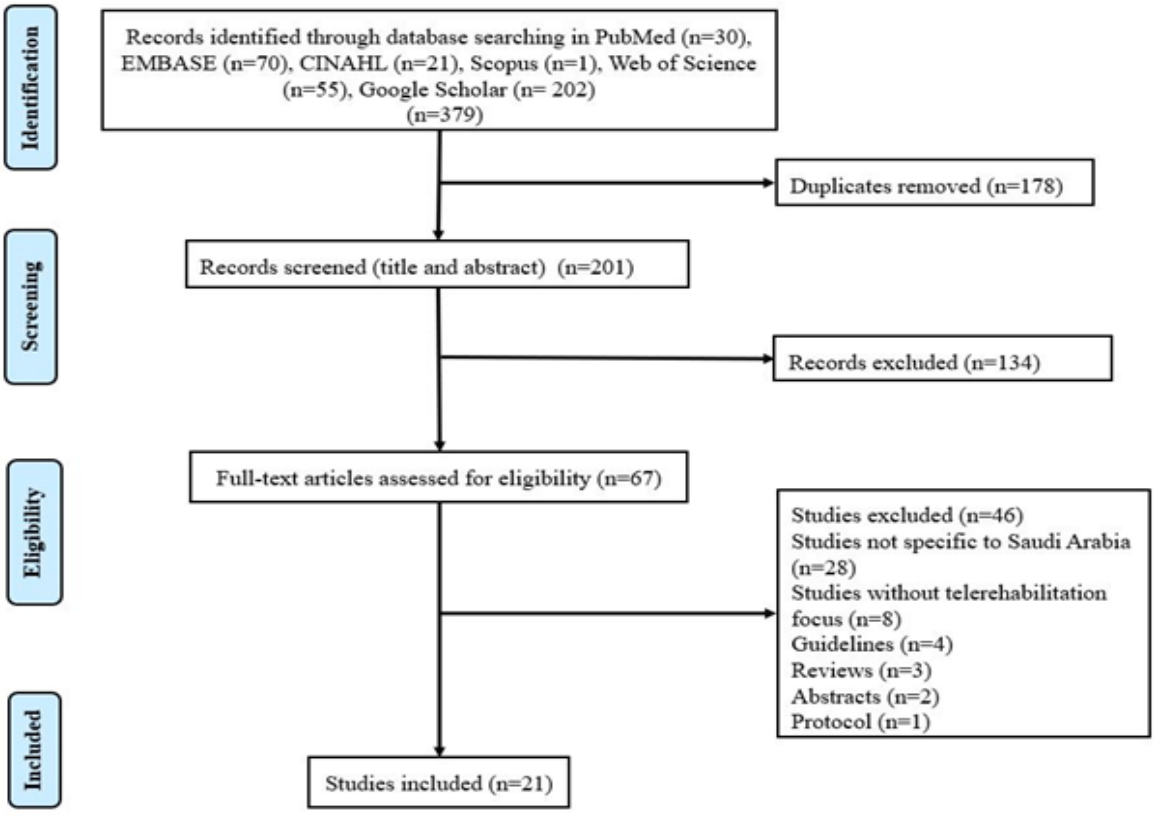


Figure 1: PRISMA 2009 flow diagram for the selection process.

Study characteristics:

This study summarized results from 21 studies published between 2019-2024.[13, 15, 18, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.] There were ten cross-sectional studies [15, 23, 31, 33, 34, 35, 36, 37, 38, 39], seven pilot studies [18, 24, 25, 26, 27, 28, 40] one qualitative study [13], two randomized controlled trials (RCTs) [29, 30] and one prospective observational study [32]. The 21 studies included in this review encompassed a total of (n=3796) participants from diverse groups (Healthy participants (n=1,659), Physical Therapists (n=1,018), Patients (n=462), Caregivers (n=385), Audiologists (n=112), Speech-Language Pathologists (n=108), Physiatrists (n=25), Occupational Therapists (n=11), Rehabilitative Nurses (n=6), Orthotists & Prosthetists (n=6), and Psychologists (n=4)).

Adoption and challenges of telerehabilitation in Saudi Arabia:

Among rehabilitation professionals, 46% were aware of telerehabilitation, but usage remained limited due to barriers (cost and lack of information about technology knowledge) [35]. One qualitative study found that 100% of occupational therapists were aware of telerehabilitation, with 78% expressing willingness to adopt it when they have sufficient training, technology knowledge infrastructure, and standardized guidelines [13]. One study reported that 25.4% of audiologists used tele-audiology, with significant dependency on infrastructure improvements and supported technology[37].

From a patient perspective, 82% found telerehabilitation suitable during the COVID-19 pandemic, with satisfaction and trust influenced by age and treatment type[38]. The use of telemedicine among Saudis reached 45.2% to avoid infection (due to COVID-19), although 62.5% preferred in-person consultations[39]. Caregivers of children with speech-language disorders experienced disruptions in care, with 70% showing a willingness to adopt telerehabilitation[23]. 80% of physiotherapy practices experienced disruptions (due to COVID-19 pandemic), and 30% used telerehabilitation, with 21% of practitioners reporting psychological distress[33]. Among the general population, tele-physiotherapy awareness was low (19%), but willingness to use it was at 58.7%, despite concerns about technical issues and privacy [34]. Moreover, a study reported that only 38.4% of physical therapists had experience with telehealth, but 71.5% expressed a desire for further training to enhance adoption [36].

Telerehabilitation for specific conditions:

Seven pilot studies included in this review reported the potentials and challenges of telerehabilitation in a variety of healthcare settings[18,24,s25,26,27,28,40]. A study on children with stuttering aged 6–15 years

demonstrated that telepractice for overt stuttering assessments yielded satisfactory reliability and high satisfaction among participants [28]. For people with knee osteoarthritis, physical therapists perceived telerehabilitation as effective, with 84.6% noting reduced costs and convenience, although the lack of physical interaction remained a barrier [18].

In other musculoskeletal conditions, a telerehabilitation program improved outcomes significantly ($p < 0.001$) across functional and pain scales, with effect sizes ranging from 0.6 to -1.9, reflecting high patient satisfaction[24]. Similarly, serious games such as "RehaBot" leveraged virtual reality for chronic neck pain rehabilitation – enhancing patient engagement and compliance through adaptive exercises [25]. A study of home health patients in Riyadh showed that awareness of telerehabilitation has increased from 57% to 96% post-intervention, with 95% of participants rating the service highly for convenience and access to specialists [26]. Further, a pilot on vestibular disorders highlighted that telerehabilitation combining gaze stability and balance exercises improved balance and reduced dizziness ($p < 0.001$), with moderate effect sizes, though confidence levels saw no significant change [27].

Telerehabilitation through RCTs:

Two RCTs examined the efficacy of telerehabilitation in addressing post-COVID-19 symptoms and infections. One study of young females recovering from mild to moderate COVID-19, a six-week pulmonary telerehabilitation program improved exercise capacity, with a 6-minute walk test increase of 14.22% in the intervention group compared to 4.21% in the control group ($p = 0.001$) [29]. Health-related quality of life also improved across physical and mental health, with scores increasing by up to 36.97% in the intervention group[29]. Similarly, a study on Type 2 Diabetes Mellitus (T2DM) patients following COVID-19 demonstrated that eight weeks of tele-physical therapy led to a reduction in HbA1c levels from 7.52% to 6.12% over 12 months, compared to 7.14% in the control group ($p = 0.001$) [30].

Discussion:

This study reviewed the use of telerehabilitation in Saudi Arabia. Telehealth seems to have gained importance during and after the COVID-19 pandemic, but its broader implementation for rehabilitation services needs further exploration. Awareness among Saudi rehabilitation professionals is relatively high. However, the utilization remains limited. A key stakeholder (i.e., patients) valued the convenience and accessibility of telerehabilitation services. Some patients reported a preference for usual (in-person) rehabilitation due to concerns

about the quality of care and the need for interpersonal connection.

The inconsistency in the use of telerehabilitation across rehabilitation disciplines and patient groups was observed[15,33,35,36]. For example, physiotherapists and audiologists reported low engagement with telehealth platforms, often reporting technological issues, financial constraints, and lack of training[15,37]. Some healthcare providers reported difficulties in replicating the quality of care that is often gained through in-person services, and patients highlighted the critical role of human interaction in fostering a sense of connection and trust. The inconsistency in the use of telerehabilitation suggests that there is a need for standardized guidelines and policies for the implementation of telerehabilitation.

Some of the included studies in this review show an increased adoption of telemedicine and telerehabilitation during the COVID-19 global pandemic. A 2024 study reported that 45.2% of Saudi Arabian used telemedicine primarily to avoid exposure to COVID-19 [39]. Another study found high patient satisfaction with telerehabilitation services, with acceptance influenced by factors such as age and the type of rehabilitation [38]. Together, these findings suggest a growing willingness among patients and clinicians to adopt telerehabilitation services, particularly when in-person care is limited.

Despite the reported positive acceptance of telerehabilitation in Saudi Arabia, its implementation has some barriers. A number of recent national studies reported challenges such as lack of training and technical challenges as major difficulties for health professionals[15,36]. Furthermore, limited knowledge and general uncertainty about telehealth among the wider population were reported [34]. These barriers are not unique to Saudi Arabia, but their impact may be more pronounced due to the relatively recent transition to digital health platforms in the country[13,15,36]. Similar challenges have been reported in other countries during the early stages of telerehabilitation adoption [41]. Given the reported barriers and challenges, structured training and public education programs can be beneficial to expanding telehealth access and awareness. It is reported that educational programs can significantly improve understanding of rehabilitation among caregivers and positively impact elderly in care facilities [42].

Healthcare providers have shown flexibility in incorporating telerehabilitation into their clinical practices – though not without challenges. For example, speech-language pathologists experienced significant role changes during the pandemic, with many adopting telehealth channels to en-

sure continuity of care [31]. Physical therapists also reported disruptions to conventional clinical care (due to the COVID-19 Pandemic) but expressed a willingness to integrate telerehabilitation services into their practice [33]. These shifts reflect the flexibility of clinicians in responding to unpredicted circumstances, although with varying degrees of readiness and support.

Specialized uses of telerehabilitation have demonstrated promising outcomes in specific contexts. A 2023 RCT investigated the impact of pulmonary telerehabilitation on young females recovering from the COVID-19 and showed significant improvements in both exercise capacity and quality of life [29]. The latter study highlighted the effectiveness of telerehabilitation programs in addressing the long-term physical and functional challenges experienced by such a population – highlighting the potential of telerehabilitation as an alternative to usual care (in-person). Similar to the previous study, another study[30] showed good improvements in glycemic control and physical health among patients with Type 2 DM receiving tele-physiotherapy sessions. These findings emphasize the potential of telerehabilitation to provide effective interventions tailored to the individual needs of populations and conditions.

The findings of this review have some implications for policymakers and healthcare professionals. Policymakers may need to develop standardized guidelines, address infrastructure gaps, and introduce reimbursement strategies to support the uptke of telerehabilitation. Healthcare providers need to prioritize digital literacy training and technical support to facilitate integration of telerehabilitation into their clinical care, while also addressing any type of resistance to telerehabilitation. For researchers, there is a need for future research on the long-term effectiveness and sustainability of telerehabilitation services, especially in diverse and rural populations in Saudia Arabia. Future research should also explore the potential of emerging technologies, such as artificial intelligence, to enhance telerehabilitation and overcome current barriers.

There are some limitations to consider in this review. The small sample sizes, reliance on self-reported data, and potential response/recall biases in the included studies should be considered. Furthermore, there is a clear lack of randomized controlled trials (n=2 included studies) which may limit the ability to draw strong causal conclusions about the effectiveness of telerehabilitation. Also, included studies were limited to specific populations or conditions (e.g., musculoskeletal and neurological conditions) – affecting the generalizability of the findings from these studies. In

addition, the possibility of publication bias is another limiting factor, as studies with positive outcomes may be overrepresented. Furthermore, our search was limited to six electronic databases, which may have led in missing relevant articles – affecting the comprehensiveness of this review. While our aim was to include only peer-reviewed studies, we acknowledge that excluding case reports and conference abstracts might have led to the omission of early or novel findings – particularly in an emerging field such as telerehabilitation. Future research may focus on larger, more diverse populations to explore relevant and meaningful outcomes, and investigate various aspects of telerehabilitation to assess the sustainability of telerehabilitation use in Saudi Arabia.

Conclusion:

This review summarized the status of telerehabilitation in Saudi Arabia. Telerehabilitation gained popularity during and after the COVID-19 pandemic, but its implementation for various rehabilitation services needs to be further studied. While the awareness among healthcare professionals is relatively high, the success of telerehabilitation relies on easing the challenges reported in this review such as technological limitations, lack of standardized policies, and insufficient professional training. To overcome these barriers, policymakers should establish standardized national guidelines to address the reported barriers. Moreover, future research should also focus on evaluating the long-term clinical outcomes, cost-effectiveness, and patient satisfaction with a mixture of clinical care approaches (in-person and telerehabilitation). By addressing these key areas, telerehabilitation can be more effectively integrated into the healthcare system, ensuring accessible, equitable, and high-quality care forallpatients.

Key Points:

- The included studies in this review indicated that the use of telerehabilitation in Saudi Arabia has gain popularity during and after the COVID-19 pandemic.
- Awareness of telerehabilitation among Saudi healthcare professionals has increased over the last few years, but its implementation needs further exploration.
- Our findings suggests that telerehabilitation can be effective in providing tailored interventions for some health conditions (e.g., musculoskeletal disorders).

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