The Open Public Health Journal
DOI: 10.2174/0118749445359378241205104328, 2025, 18, e18749445359378
ISSN: 1874-9445

RESEARCH ARTICLE **OPEN ACCESS**

Perceptions and Knowledge of Health Professionals about Telerehabilitation in Limpopo Province, South Africa

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Abstract:

Introduction: In the digital age, telerehabilitation emerges as a promising solution to healthcare disparities, offering healthcare services comparable to in-person care. Telerehabilitation utilizes information and communication technology (ICT) infrastructure to deliver rehabilitation services remotely. It requires essential resources such as tablets, computers, and applications like Skype, Zoom, and WebEx for audio-video communication between patients and healthcare professionals.

Aim: The aim of this study was to explore and describe the perceptions and knowledge of healthcare professionals about telerehabilitation in the Elias Motsoaledi Municipality, Limpopo Province, South Africa.

Methods: Through an exploratory qualitative study design, semi-structured, one-on-one interviews were used. Twenty health professionals were purposefully recruited and interviewed as participants in this study. Participants were recruited and interviewed until data saturation was reached, meaning that categories appeared to guide the collected data without further modification. Healthcare professionals were included if they have a tertiary qualification. A minimum of two years of professional service within their respective profession. Participants were included if they were health professionals in direct contact with patients. Data were collected through one-on-one individual interviews with the 20 participants, using a semi-structured interview guide of open-ended questions. Thematic analysis was used to analyze the transcribed data. The approval to conduct the study was sought from the Biomedical Research Committee.

Findings: The analysis revealed three main themes and eleven sub-themes that highlight the perceptions and knowledge of the participants. The participants were knowledgeable about telerehabilitation. Although telerehabilitation is not operationalized in public healthcare facilities, the participants shared their understanding and the benefits associated with it. Furthermore, the participants reported that there is a potential space to implement Telerehabilitation in public healthcare facilities. However, such implementations have serious financial implications, which can serve as a challenge for implementation in South Africa.

Conclusion: Therefore, the current study concludes that telerehabilitation is a worthwhile investment in healthcare facilities. Interventions are required by the government to mitigate the implementation challenges of telerehabilitation in South African healthcare facilities. The current study recommends that strategies be required to roll out demo-prototypes of telerehabilitation programs.

Keywords: Diabetes, Intervention, Healthcare facilities, Healthcare services, Health professionals, Telerehabilitation.

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Cite as: Malema M, Frantz J. Perceptions and Knowledge of Health Professionals about Telerehabilitation in Limpopo Province, South Africa. Open Public Health J, 2025; 18: e18749445359378.
http://dx.doi.org/10.2174/0118749445359378241205104328

Received: October 08, 2024
Revised: November 05, 2024
Accepted: November 12, 2024
Published: January 6, 2025

1. INTRODUCTION

Telerehabilitation utilizes information and communication technology (ICT) infrastructure to deliver rehabilitation services remotely [1]. It requires essential resources such as tablets, computers, and applications like Skype, Zoom, and WebEx for audio-video communication between patients and healthcare professionals [2-5]. Additionally, data management and documentation utilize electronic health records (HER) [6, 7]. Telerehabilitation has been proven to be effective in minimizing pain and improving function in patients with lower back pain, osteoarthritis, and neck pain [7]. Patients with various illnesses and conditions can attain positive results from telerehabilitation, just as they would when receiving rehabilitation face-to-face [4].

The goal of telerehabilitation is to provide healthcare services remotely whilst ensuring that the quality of care and the safety of the patients are maintained the same as in face-to-face rehabilitation sessions [8]. It enables different healthcare professionals, such as physiotherapists, physicians and biokineticists, to be able to work together as an interdisciplinary team towards the patients' rehabilitation and overall wellness [2]. Some of the benefits of interdisciplinary work from different healthcare professionals include improved patient outcomes [9, 10], holistic and coordinated care [11, 12], enhanced patient safety, increased patient satisfaction [13, 14], efficient use of resources [15, 16] and professional development [9, 16].

Studies in Tanzania, Nigeria, and South Africa have demonstrated telerehabilitation's potential to address the shortage of rehabilitation professionals and improve access to services, particularly in rural areas [17-19]. However, implementation requires careful consideration of various factors. A study by Sarfo *et al*. investigated the potential use of telerehabilitation for stroke patients in Tanzania [17]. They found that telerehabilitation could be a viable solution to address the shortage of rehabilitation professionals and improve access to stroke rehabilitation services in the country. A study by Gatica-Rojas *et al*. investigated the use of telerehabilitation for children with cerebral palsy in Nigeria [18]. They found that telerehabilitation could potentially improve access to rehabilitation services for children with cerebral palsy in rural areas [18]. A study by Tar-Mahomed and Kater explored the feasibility of using telerehabilitation for stroke patients in South Africa [19]. They found that telerehabilitation could be a viable solution to address the shortage of rehabilitation professionals in the country [19]. Although there is potential for telerehabilitation in different African countries, this does not mean a simple implementation. There are many factors that need to be considered in relation to implementation, training, and the alignment of various departments to allow coherence.

This study is guided by two frameworks: primary health care (PHC) and the community-based rehabilitation matrix (CBR). Primary Health Care focuses on client-centered rehabilitation with the intention to promote the individualization of programs to the patient's needs to facilitate a smooth transition between rehabilitation clinics and programs and their communities [20]. This notion justifies telerehabilitation in the present study to have patients diagnosed with diabetes transition from healthcare facilities to a virtual environment. Complementing PHC is the CBR matrix, which includes domains such as health, education, livelihood, social, and empowerment [21]. The premise of the current study resonates with the CBR in the context of offering telerehabilitation to improve health services and interventions for patients diagnosed with diabetes without being confined to a specific site. The premise of the present study rests on the notion that telerehabilitation will alleviate some of the barriers confronted by patients and healthcare professionals. Specifically, focusing on patients and the challenges they could face.

The scarcity of transportation, the shortage of healthcare professionals, and the lack of money to travel long distances are some of the issues that need to be addressed to provide patients in rural areas to get access to rehabilitation services [22]. Telerehabilitation bypasses obstacles that make accessing rehabilitation difficult or impossible, especially in rural areas [2, 5]. Patients with chronic conditions require on-going observation, guidance, and follow-up sessions, which healthcare professionals can conduct successfully using telerehabilitation [17]. Telerehabilitation can support continuity of care by enabling remote monitoring and follow-up, which is essential for maintaining progress and preventing regression in rehabilitation programs" [8]. Telerehabilitation is seen as a model that enables the delivery of healthcare services, reduces travel expenses, shortens inpatient stays, and provides healthcare services in the comfort of the patients' homes, which can improve adherence to treatment plans [6, 23].

The healthcare professionals should explain in detail everything that telerehabilitation entails before the patient signs an informed consent form [8]. According to Beauchamp and Childress, when a patient signs an informed consent form, they are confirming that they are aware of the treatment plan they are undertaking [24]. By providing the patients with an informed consent form, the healthcare professionals will be protecting themselves from possible legal liabilities [24]. Some of the dangers that can be avoided by issuing patients with informed consent forms include violations of patient rights and ethical concerns [24-26]. The need for conducting the current study is therefore justified. This study thus aimed to explore healthcare professionals' perceptions and knowledge about telerehabilitation in the Elias Motsoaledi Municipality, Limpopo Province, South Africa.

2. METHODS

A qualitative approach through an exploratory design was used in this study. The objectives of the study were to explore the availability of healthcare professionals needed to design a telerehabilitation programme for patients diagnosed with type II diabetes in Elias Motsoaledi municipality. To explore and describe health professionals' understanding, perception, and attitudes about Telerehabilitation in Elias Motsoaledi municipality. To explore the availability of equipment and resources needed to design a telerehabilitation programme for patients diagnosed with type II diabetes in Elias Motsoaledi municipality. Swaraj describes exploratory research as the preliminary study of an unfamiliar problem about which the researcher has little or no knowledge [27]. Exploratory research is characterized by its flexibility.

2.1. Study Setting

Participants were recruited in liaison with the study conducted in Elias Motsoaledi Municipality and the Limpopo Department of Health, South Africa. The participants were recruited from healthcare facilities in the Elias Motsoaledi Municipality, Limpopo Province, South Africa. Elias Motsoaledi Local Municipality and the local health department, Limpopo province, South Africa. The Elias Motsoaledi Local Municipality (formerly known as Greater Groblersdal Local Municipality) is located in the Sekhukhune District of the Limpopo Province. It is one of four municipalities in the district. The seat of the municipality is Groblersdal. The municipality is named in honor of the late Elias Motsoaledi, born on 26 July 1924 in Nebo, Sekhukhune land. According to Statistics South Africa (1998), Limpopo is the second-poorest province in South Africa [28]. About 57% of the population comprises people who speak Northern Sotho, also known as Sepedi [28].

2.2. Population and Sampling

Participants were recruited in person and follow-up appointments accordingly. Participants ranged in age from 18 and 60 years. There are over 100 health professionals in the Elias Motsoaledi Local Municipality. Purposive sampling was deemed necessary to ensure that the correct participants were included. Purposeful sampling was deemed necessary, relevant, and suitable to ensure that the correct participants form part of the official participants. Twenty healthcare professionals participants were purposefully recruited for this study. Participants were recruited and interviewed until data saturation was reached, meaning that categories appeared to guide the collected data without further modification [29].

2.3. Inclusion and Exclusion Criteria

Healthcare professionals were included if they have a tertiary qualification. A minimum of two years of professional service within their respective profession. Participants were included if they were health professionals in direct contact with patients. Participants were excluded if they were day visitors offering specialized health services in the health facilities. Auxiliary service professionals were excluded because their role is more supportive than being on the forefront when dealing with patients diagnosed with type II diabetes.

2.4. Data Collection

Data were collected through one-on-one individual interviews with the 20 participants, using a semi-structured interview guide of open-ended questions. The interviews lasted between 45 minutes and an hour, depending on the knowledge of the participant concerning the topic as well as the interactions between the researcher and the participant. Participants included in this study were health professionals in direct contact with diagnosed patients with type II diabetes. Consent to record the interviews was obtained from the participants, and interviews were conducted in a secluded area for privacy as well as to make certain that the participants were comfortable.

The interview guide included the following key questions: (a) In your opinion, what does telerehabilitation mean to you? (b) In your opinion, tell me what do you think the level of preparedness for telerehabilitation in your workplace is? (c) What technology-orientated equipment and resources are available in your facilities? (d) In your opinion, what support structures does the facility have in terms of equipment and resources? (e) In your opinion, what do you think about the reliability of telerehabilitation? (f) In your opinion, what are the benefits of telerehabilitation to patients? (g) In your opinion, what are the main barriers to knowledge in telerehabilitation? Data for the study were audio-recorded and then transcribed verbatim.

2.5. Data Analysis

Thematic analysis was used to analyze the transcribed data. Bruan and Clark describe thematic analysis as an approach for identifying, analyzing, and reporting results patterns within the data, which includes organizing and describing the data set in a rich and detailed manner and interpreting the variables of the research topic [30]. Furthermore, Rapley reported identifying the initial themes and concepts, developing subthemes, applying a thematic framework to the themes and subthemes [to avoid repetition], and making meaning of the themes [31]. Data

were analyzed through open coding using Atlas ti.8 software program. Broad topics and themes were identified from each interview transcript, and after that, cross-coding occurred across all the interviews. An independent co-coder was sought, and a consensus was made regarding the themes and sub-themes, contributing to the study's trustworthiness.

2.6. Trustworthiness

The study consists of inter-strategies that promote the rigor of this study. Schurink *et al*.'s model of trustworthiness was employed, focusing on credibility, transferability, and dependability [32]. The credibility of this study was ensured by facilitating complex engagement with participants during data collection, debriefing, and observations [32-34]. This allowed the researchers to thoroughly probe participants and explore any questions to get rich perceptions and experiences from the participants. Transferability was achieved by thoroughly applying the research methodology and including direct quotations from participants [32-34]. Lastly, dependability was ensured using an independent co-coder and discussions to avoid bias and strengthen the study's data and rigors [32-34]. The researcher engaged and explored all forms of observations, body language, probes, and que to ensure that participants exhaust their perceptions and experiences. The researcher observed all details and phenomena during the interview phase and explored the participants' reactions, body language, and behavior. Member checking was conducted to verify that the analysis accurately reflected participants' experiences.

2.7. Ethics

The approval to conduct the study was sought from the Biomedical Research Committee of the University of the Western Cape (BM22_6_41). Additional permission from the Department of Health in the Limpopo province, Elias Motsoaledi municipality, was obtained before data collection (LP202304023). The study conforms to the Helsinki Declaration of 1975. Participants were informed about the study and invited to participate, and those who gave consent were checked against the inclusion and exclusion criteria. The information sheet, consent form, and survey were in two languages (English and Sepedi). Eligible participants were given informed consent forms to sign to confirm participation. Each participant was given an information letter explaining the study's content. Participants were informed that their participation was voluntary and that they could withdraw at any time without prejudice. Their names and identities were kept confidential, with pseudonyms assigned to promote anonymity. The collected findings were processed in accordance with the South African POPI Act.

3. RESULTS

The present study was conducted on health professionals in Elias Motsoaledi municipality, Limpopo province, South Africa. The findings are presented in two folds: the participants' profiles and characteristics and the main findings of the present study. Table **1** below shows the participants' profiles.

The participants in the present study were equally and proportionally represented. The participants of the present study were health professionals with valuable experience with patients diagnosed with diabetes. The following section will focus on the main findings for the present study. Table **2** below demonstrates an overview of the main findings, reporting the themes and subthemes of the study.

Table 1. Participants' demographic profiles.

Profile	Ethnicity	Role	Years in Service	Type of Health Facility
P1	African	Nurse (Second in Charge)	11	Public Clinic
P2	African	Nurse	6	Public Clinic
P3	African	Nurse	6	Public Clinic
P4	African	Nurse	30	Public Clinic
P5	African	Nurse	8	Public Clinic
P6	African	Doctor	12	Public Clinic
P7	African	Nurse	17	Public Clinic
P8	African	Nurse	6	Public Clinic
P9	African	Nurse (Operational manager)	35	Public Clinic
P10	African	Nurse	22	Public Clinic
P11	African	Physio-therapist	33	Public Clinic
P12	African	Nurse	10	Public Clinic
P13	African	Nurse (Operational manager)	15	Public Clinic
P14	African	Nurse	10	Public Clinic
P15	African	Nurse	31	Public Clinic
P16	African	Nurse (Second in charge)	17	Public Clinic
P17	African	Nurse	9	Public Clinic
P18	African	Nurse	28	Public Clinic
P19	African	Doctor	36	Public Clinic
P20	African	Nurse	15	Public Clinic

Table 2. Overview of the findings.

Themes	Subthemes	Quotation
Knowledge about telerehabilitation	Meaning of telerehabilitation	*"This is rehabilitation via either video conferencing or like on a TV screen whereby you can be talking to either a physiotherapist or an occupational therapist, Biokineticist over the…uhm TV"***P16**
	Understanding telerehabilitation	*"when a person goes to consult, they call the doctor for the patient to consult. For example, to see how the baby is doing and so forth"***P10**.
	Administering telerehabilitation	*"However, at the beginning…when we start to give them information about all this, we are going to need a person to explain to them fully and we also have to encourage them to attend open days and also encourage them to ask the questions"***P20**
	Health education	*"It's mostly lack of information"***P7**.
Attitudes about telerehabilitation	Prospects of using telerehabilitation	*"now if this tele-rehabilitation becomes successful, the physiotherapists that we are having in our hospitals. She…they can talk with the patients from their office, talking with them whilst they are in the comfort of their own homes"***P10**.
	Resources availability	*"Space. We might not have space for the patients if this telerehabilitation is to be brought to the clinic. We do not have enough space here in the clinic" P16.*
	Reduced overwork for staff	"I think it will help us with the long queues, our work will be more efficient as we will get more help from other professional workers. The more patients get help from different healthcare workers, the easier the work will be for us also" **P18**.
Health care in South Africa	Positive outcomes related to telerehabilitation	*"they will benefit because they will get to see the OT and the Physio more frequently than they do now"***P15**.
	Uninterrupted services	*"meaning that we will need a generator or a converter. To keep the electricity running so that this telerehabilitation can go on"***P15**
	Concerns about telerehabilitation	*"For instance, if you are working in the same cubicle, still it has confidentiality because maybe I will be using a laptop but I will be in a cubicle"***P9**.
	Challenges within healthcare	*"Limpopo is not advanced, there is a shortage of a lot of things aowa (no), there's a lack of a lot of things"***P3**.

3.1. Theme 1: Knowledge about Telerehabilitation

Telerehabilitation often involves the transfer of large data files, such as medical images, sensitive patient information, including medical records, personal details, potentially identifiable data, assessment data, or exercise videos, between a patient and a healthcare professional [2]. The knowledge of telerehabilitation is important for the current study; this will aid with further phases and eventual implementation stages. The current theme reports four sub-themes, which include the meaning of telerehabilitation, understanding telerehabilitation, administering telerehabilitation, and health education.

3.1.1. Subtheme: Meaning of Telerehabilitation

It is important in the present study to understand how health professionals make meaning of telerehabilitation. This was important to check against the knowledge about telerehabilitation and how they interpret the meaning of it. Participants in this sub-theme conceded that:

Some participants have a general understanding that telerehabilitation involves using a device such as a phone, TV, and other communication technological devices that are used to offer services for rehabilitation and health consultation purposes (**P1, P5, P6, P10, P12, P15, P17, P20**).

Additionally, other participants expressed their understanding, reporting that:

*"It can be a place where people are being taught about something. Let me say people… stay…let me say the elderly people are being taken care of, in that place"***P19**

*"It's a message that arrives quickly regarding rehab… It's to relay the message quickly"***P3**

*"It can be a video call whereby a nurse or doctor can call and you are able to see them. That way you can be able to consult over the phone"***P4**

*"telerehabilitation, personally I think err…it can be talking about the improvement of certain things including…it could be lifestyle or certain behavior or disease. You can rehabilitate the patient"***P6**

*"I am not quite sure, I am only thinking that it is the…maybe…rehabilitation err…but I am not quite sure it's related to what… I mean this telerehabilitation, it's like I am talking to you, or you are giving a service to a patient while you are in Cape Town, right."***P7**

Despite the above definitions and perceptions from the participants, there were some participants who did not know telerehabilitation.

Participants expressed that it was the first time hearing about the concept of telerehabilitation. The participants reported that they have no idea what to associate the concept with as it is news to their ears. **P13, P18, P19**

The subtheme above details information about what participants perceived in relation to what it means. The majority of participants had an idea of telerehabilitation and how they associated it with what it means to them and how it is applicable to their profession. There were a few participants, however, who did not or had never heard of telerehabilitation.

3.1.2. Subtheme: Understanding Telerehabilitation

In this subtheme, it was important to explore how participants' knowledge about telerehabilitation translated into deeper meaning to demonstrate their understanding

with examples of other similar methods. Participants in this sub-theme reported that:

*"So, this means that this thing is exactly like the one in Dischem when you are going to consult, they all the doctor who is in another place"***P10**

*"That will encourage them [*patients*] to say, some of the things they can do them at home because that will be an everyday thing, like…today we book them for OT or Physio, they lose interest but when we book the sessions here [*virtual*] and they see the exercises visually, they'll see that okay…even I have been told that I must do this and this"***P14**

*"Instead of meeting face-to-face, it's something that we can do through a phone. That's what I think it might be. Maybe something like an App, yeah. Maybe it can also give you…err what do you call it? Health education about certain conditions or err…diseases"***P1, P2, P5**

*"The patients will be talking to a professional, there is no way a professional will lie to you just because the service is provided over the phone. There is no difference between talking over the phone or face-to-face"***P5**

The findings in this sub-theme reported findings related to how participants understand telerehabilitation. Practical demonstrations and similar methods to show their understanding were evident in this subtheme. It is evident that participants understood how tele-rehabilitation works and how it is used within the healthcare system.

3.1.3. Subtheme: Administering Telerehabilitation

Telerehabilitation requires complex and complementary services. Telerehabilitation requires patients and healthcare professionals to make use of technological equipment to transfer files with confidential information [6]. It was important to understand the perceptions of participants. In this subtheme, participants reported that:

"We need the training. I mean for everything we need training. We need to be more empowered about it and the way to implement it [telerehabilitation] *100%. But if you are doing something you are not sure of yourself and then along the way it will be difficult because you don't understand how its works"***P9**

*"There are people that…when you try to show them something and they don't understand it, you then have to try by all means to tease and persuade them to come to try and learn about that particular thing… And when you give them the information, you have to be on their level"***P20**

*"Yeah, aren't some patients are elderly. They might not know how to use it. So, we have to be able to explain to them how this thing works. Isn't it you can't talk to a patient about something that you don't really know"***P5**

*"No, you are not taking our jobs, you see…they can say there is a walking robot…in USA at the factories, they say they have a machine that does 1, 2, 3 and 4 meaning that there won't be any need for people to work… this one doesn't replace, Yes, it compliments… As a multidisciplinary team"***P6**

As a matter of reliability when administering telerehabilitation, participants reported that:

*"I would say it can be trustworthy because we will be getting help from the department of health. So, that's something that can be trusted"***P4**

*"I think it's going to be reliable because it comes from the department, it means we will be getting real doctors. I think it's going to be reliable because it will be coming from people that are qualified professionals"***P5**

The participants in the subtheme demonstrate a level of understanding required to administer a tele-rehabilitation service within their profession. The participants shared their perceptions which included that administering telerehabilitation requires a team effort to ensure success. Furthermore, the element of reliability needs to be understood to ensure that as health professionals trust the reliability of telerehabilitation.

3.1.4. Subtheme: Health Education

It is important that both health professionals and end-users of telerehabilitation services are educated and possess sufficient knowledge. In this subtheme, participants expressed the role of health education. This is perceived in two ways: for professionals and patients. Participants in this sub-theme reported that:

*"… there should be training for staff members just in case it comes in the form of an App. We have to know how it really works… So we have to go to the patient fully informed so that when they ask questions we can be able to answer them, yeah"***P5**

"Yes, isn't it that some patients refuse to even come to the clinic sometimes. So, if we tease them with these kinds of events [community outreach], *they normally do come to attend. That's how they get information most of the time"***P19**

*"Sometimes there is…we usually have things called "open day" at the beginning of the year… Where we are going to…we are going to talk to them about all the services that we offer"***P20**

However, there is a perceived gap within the health profession. This is expressed by some participants, stating that:

*"… there is lack of knowledge regarding this or there's no one telling you about it"***P2**

*"We are hearing such things for the first time because of you"***P7**

*"Some of these things we are hearing about them for the first time from you"***P3**

*"We don't have knowledge regarding these things"***P4**

There is also an evident flaw emanating from patients. This is reported by a participant who stated an experience encountered where patients are self-diagnosing themselves. The participant reports that:

"They [patients] *google their diagnosis and when they come, they are like "Sister, I've got err meningitis". And you're like "but how…how…how do you find out 'Cuz you*

have to get blood so that you can know that you've got meningitis? Sometimes some fight, they don't believe that err they don't have what they say they don't have" **P1**

The participants in this sub-theme demonstrate that health education plays a vital role in understanding how systems work. This can relate to programs and other general health awareness, and people and patients are conscientious. Participants further report that there are some gaps, as they are, at times, unaware of certain trends and programs.

3.2. Theme 2: Attitudes about Telerehabilitation

The health levels of good quality of life can include responsiveness and equity, professional staff training, and a well-monitored health system [35]. It is, therefore, necessary in this theme to understand the attitudes of health professionals about telerehabilitation. It is important in the current study that health professionals must have a positive attitude in order for a successful telerehabilitation program to be implemented successfully. In the current theme, the findings of this study are reported under the subthemes: prospects of using telerehabilitation, resource availability, and reduced overwork for staff as an attempt to explore the attitudes related to telerehabilitation.

3.2.1. Subtheme: Prospects of using Telerehabilitation

The implementation and usage of telerehabilitation are not reported. Thus, it is important in this subtheme to report how health professionals were anticipating the use of telerehabilitation. Participants have reported their perceptions, stating that:

"… now if this tele-rehabilitation becomes successful, the physiotherapists that we are having in our hospitals. She…they can talk with the patients from their office, talking with them whilst they are in the comfort of their own homes… I really think that the patients are going to benefit so much from it [telerehabilitation]*… Without the patients coming to the hospital, the family member is the one who's going to assist the patient at home*." **P10**

*"Yes, I think it will help the patients. It's really needed… we will be getting more hands to help the patients instead of them coming to see our OT and Physio only once in a while"***P12**

*"The way I see it is that, I think it will benefit the community because some of the conditions or some of the main complains of the patients really they do need rehabilitation"***P13, P14**

There are some perceptions expressed by participants indicating the benefit of telerehabilitation for health professionals and patients. Participants reported that:

*"I think it will also benefit us as staff members because most of the patients…some of the complains really don't need medication"***P14**

*"Yes, and some patients are not consistent with their visit to the physio and that delays them from getting used to the session. So, I think if this tele…what-what is brought here, it will help patients to stick to their visits"***P15**

*"Then you will find out that the patients that are in the hospitals don't get to see the Physio or the OT, for example. So, if it's telerehabilitation, a whole group of people will be able to be helped"***P17**

*"I think the patients will really get help in terms of like…not having to stress about traveling too far to find other healthcare professionals. They will have quick access to healthcare services whenever they need"***P19**

The participants in this sub-theme reported various scenarios and potential benefits of using telerehabilitation. It is evident that telerehabilitation can benefit both health professionals and patients within the healthcare services in South Africa. It is, therefore evident from the findings that participants are eager to use telerehabilitation in their workplace.

3.2.2. Subtheme: Resources Availability

To ensure the uninterrupted, efficient functioning of telerehabilitation, reliable technical support specialists are needed to deal with issues that may cause connectivity problems, software glitches, as well as audio-video complications [1, 2, 6]. Participants in this sub-theme reported that:

The majority of participants expressed that resources are limited in their workplace. They report that their only equipment available is a laptop or PC, which is used for data capture. This worsened when participants stated further that there is no Wifi and data for connectivity within their premises. **P11, P12, P13, P14, P15, P18**

Some of the participants in the study further suggest what equipment would be required. The participants reported the following:

There is a need to have more laptops or tablets within the facilities. This will enable the implementation of telerehabilitation to be successful. Additionally, the availability of networks and data is essential. **P2, P16, P19, P20**

It is unfortunate that there is a lack of resources. This has the potential for a delay and possible interruption in implementing telerehabilitation. Based on the findings, it is apparent that for telerehabilitation to be implemented in Elias Motsoaledi, a lot of investment is required. This will help to facilitate the implementation of telerehabilitation.

3.2.3. Subtheme: Reduced overwork for Staff

The present subtheme reports the potential impact telerehabilitation has on staff in health professionals. It is anticipated that the implementation of telerehabilitation within the health services will alleviate the pressures and workload on staff. Participants in this subtheme reported that:

*"So, with that…errr telerehabilitation, I think it will help in a way that …like…if we group these people, right? And they are helped by one Physio or one OT, the professional will be able to get a whole group…assisting a group…unlike if it's physical, you will find that maybe the professional was able to see only 3 patients"***P1**

*"Okay, it is going to benefit patients because when there is a need for Physiotherapy, they can be able to do these exercises in the comfort of their own home… Because where we are, sometimes they can say a Physiotherapist only comes on Wednesday. So, over the phone, you can get access to them day and night, yeah"***P5**

*"There is no need for longer queues, nurses…they do not want a lot of nurses anymore"***P6**

*"… let me put it this way, we as the staff members will benefit from it. We will have a sense of feeling that we have at least accomplished something. We were able to help the patients to get access to physiotherapists and occupational therapists. Meaning that we will be getting a sense of accomplishment"***P19**

The findings in this subtheme report that health professionals will benefit from telerehabilitation. The impact will have a positive impact in terms of workload and the number of patients seen by health professionals. It is therefore important to have telerehabilitation introduced within health services. This will lead to multiple benefits and across various departments.

3.3. Theme 3: Healthcare in South Africa

Health systems in South Africa and Africa at large can be perceived as inequitable in respect to delivery and finances [36]. The present theme puts forward that there has not been a change with respect to the delivery and finances of health services in South Africa. Therefore, in the present theme, it is important to explore the state of healthcare services in South Africa against the prospects of telerehabilitation. The present theme will report the subthemes: positive outcomes related to telerehabilitation, uninterrupted services, concerns about telerehabilitation, and challenges within healthcare as they relate to how telerehabilitation features in the healthcare services of South Africa.

3.3.1. Subtheme: Positive Outcomes related to Telerehabilitation

There are numerous advantages of using telerehabilitation in health care services. The participants under this subtheme reported their perceptions of how telerehabilitation will benefit their current services in their workplace. Participants state that:

*"These types of rehab exercises can help pills or work together with the pills so that the illness can be under control if its chronic and then if it's orthopedic, the person can get stronger and then the person can lead a normal life compared to depending on pills… for an example, if we have grouped the patients for a Physio on a Wednesday, and the patients come being 20 or 25. You see the Physio will get a whole large number and be able to help those patients. That will be a benefit"***P1**

"It [telerehabilitation] *will help patients to not travel to far places just to get healthcare, receiving healthcare services at home"***P2**

*"Isn't it now we don't really have these services in our clinic, a lot of people will be able to save money. They won't be going to hospitals for rehabilitation… The second thing is that they can be able to access the health care professionals (Physiotherapists and Biokineticists) at anytime"***P5**

*"They will not have to stand in line to see the Physiotherapist because most of the time, the Physiotherapist only comes once a week and she only sees a few patients. Most of the time the patients will have to wait online waiting for the physio to be done with other patients"***P15**

Some participants reiterated the point that if implemented, telerehabilitation will save patients money, as they will not need to travel long distances and spend a day in healthcare facilities. Participants reported that:

*"I do not think it would be a problem if patients travel to the hospitals if they really need the help"***P1, P8**

"it [telerehabilitation] *will benefit our patients because err…it will be easy for them not to take the ups and downs, they will be here and they will have enough information that they are needing"***P9**

The findings in this subtheme present evidence about the role and impact telerehabilitation will have on patients and within the healthcare sector. The benefits and impact are practical and life-changing. It is without a doubt that patients will be looked after while also assisting health professionals, and being productive and keeping up with the trends.

3.3.2. Subtheme: Uninterrupted Services

To ensure the uninterrupted, efficient functioning of telerehabilitation, reliable technical support specialists are needed to deal with issues that may cause connectivity problems, software glitches, as well as audio-video complications [1, 2, 6]. The participants in this subtheme expressed their opinion and reported that:

*"I also think that one of the reasons why patients cannot access the Apps is due to lack of data, load shedding and some places do not have networks at all… Vodacom's signal is always available, but it can be troublesome at times"***P5**

*"Connectivity will be a challenge. If maybe we can connect it and do the video call…isn't…maybe somebody will be presenting from the hospital but if there's load shedding, some of the networks are not working very well. Then that becomes a challenge, you see that the main cause"***P15**

*"We wouldn't want the patients to miss their sessions because of network problems"***P16**

The findings under this sub-theme provide a clear demonstration that telerehabilitation requires complementary services to be successful. There are other critical sectors that will require governmental interventions, such as the current load-shedding electricity crisis. These findings play an important role in the implementation phases for telerehabilitation.

3.3.3. Subtheme: Concerns about Telerehabilitation

It is without a doubt that concerns will emerge related to telerehabilitation. The concerns can stem from people who will administer the services, the privacy elements, and administrative concerns related to telerehabilitation. Participants under this subtheme have reported their concerns, stating that:

*"Like, if we can…if …if we didn't explain much to them, then they will have a problem with this whole thing. With confidentiality, as long as we can explain to them the purpose of it all. Some have a problem because they didn't get that much explanation and also, the main…the benefit of the activity"***P14**

*"The main thing will be consent… We should get their consent first because…for example, we will bring them to a workshop in a way and tell them that on such and such a day, there's going to be 1,2 and 3. Isn't it you will tell them one-by-one, let's say for example today there is a patient and then we as the staff members we tell the patient that in such and such a date, there's going to be this kind of a workshop happening, do you agree…and you won't be the only one there…do you agree? And then if they agree…meaning that the patient is giving you consent… And then we will know that the patient is with us"***P17**

An interesting penny for thoughts was by participants who questioned the impact of telerehabilitation on the personnel. The participant expressed that:

*"But, maybe the question is, who's going to assist the patient. The clinic staff, the current clinic staff or particular…or we are going to have an extra employee or Physiotherapist or OT who is going to assist them?"***P13**

Another participant expressed a concern that will impact the patients. The participant reported that:

*"Some patients do have smartphones and some patients do not have"***P4, P7**

The findings under this subtheme demonstrate evidence that it will not be a smooth sailing process when implementing telerehabilitation. This is categorized by factors that are beyond an individuals' capacity; therefore, collaborations will be required to ensure the successful implementation of telerehabilitation services.

3.3.4. Subtheme: Challenges within Healthcare

The challenges in South Africa are diverse and can, to some extent, impede livelihoods and quality of life. Health care services are characterized by inequalities, which include ethnicity or race, gender, and socio-economic status across the population in South Africa [37]. Participants under this subtheme report their perceptions about challenges within healthcare, stating that:

*"there is a huge shortage of OT, there's a shortage of Physios"***P15**

"lack of information [amongst health professionals in different countries and the areas we service] *… it's because our area or our province in general is backwards with technology and almost everything. So, it takes time for other things to arrive here. Unlike if you go to Gauteng, you will find that they are far, we usually follow on them"***P3, P9, P19**

*"Yeah, lack of training, but also we can't be trained on something that we have never been told about. We do not know anything about them. Even the department of health didn't tell us anything about something of this sort. So, if ever it was mentioned, maybe we would know something about it"***P5**

Expanding on this notion, other participants expressed that the challenge is also influenced by people within the health system. One participant stated that:

*"And some people are resistant to change. We handle change differently. So, but because we…it's the era of…of err…what's that? Err…telephones and media and all. So I think it will be easier for us also. I can say they can be prepared… And also the knowledge. So, as I mentioned earlier, people react differently to change. Some they can be negative towards it, some they can be positive towards it so yeah those I think they can be challenges"***P1**

The participants under this sub-theme give evidence about the discrepancies within the South African healthcare system. There are some challenges that can easily be overcome; adaptability and the embrace of new trends and technology are important to overcome some challenges reported under the present subtheme.

4. DISCUSSION

The present study reports and describes the perceptions and knowledge of healthcare professionals about telerehabilitation in Elias Motsoaledi Municipality, Limpopo province, South Africa. Participants in the present study were health professionals working in different settings across the Elias Motsoaledi Municipality, which include primary health care clinics, hospitals, and private practices offering health services. The participants in this study possess valuable working experience in South Africa and have demonstrated their passion for delivering and making an impact on the lives and livelihoods of patients, including people diagnosed with type II diabetes. It is evident that the participants' diverse health discipline can improve the health and quality of lives for people in the selected municipality. Literature supports the use of telerehabilitation in health systems to reduce deteriorating conditions to promote active activities of daily living [38]. The challenge in providing telerehabilitation, particularly in sub-Saharan Africa is that healthcare is provided by public facilities which are financial constrained due to the budget allocations from government; and private institutions wherein the patients' needs to pay for the services render *via* medical aid benefits or cash on services [39].

The findings of this study reported three main themes and eleven sub-themes that highlight the perceptions and knowledge of the participants. Participants had limited knowledge about telerehabilitation. The findings of this study align to Telerehabilitation can be used as a complementary to pills and is popularly known as a home-

based rehabilitation service provided using communication technologies [40]. Telerehabilitation can bridge the gap between patients and health professionals in this study, as it will allow them to conduct their consultations remotely [38]. Telerehabilitation is considered a cost-viable health service and bridges the accessibility challenges; furthermore, it offers a quality health service [41, 42]. The findings from the present study align with the literature and complement the understanding reported already. According to Nizeyimana *et al*., telerehabilitation as an alternative, is worth being explored as an alternative for integral health systems for feasibility and implications, particularly in low- and middle-income countries such as South Africa [43]. The findings from the present study create a gap in implementing the domain of information and education within the PHC framework [20]. This has the potential to raise more awareness and educate relevant stakeholders who work with patients about telerehabilitation, its use, and its benefit to patients and staff. Complementing the PHC framework, telerehabilitation will then be incorporated within the CBR model to ensure comprehensive care for all patients within their communities [21].

Although telerehabilitation is not operationalized in public healthcare facilities, the participants recognized its potential benefits. The study indicates a possible opportunity to introduce telerehabilitation in public healthcare facilities. Contrary to the findings in this study, telerehabilitation in low- and middle-income countries will take a lot while to implement due to the constrained resources [43]. These findings from this study underscore the need to build capacity and offer equitable access to health services [44]. This is under mounting pressure to over universal access to health services that are reliable and of good quality [45]. The current discrepancies in South Africa, particularly in basic services such as healthcare, are evident by the findings from the present study. Kelly *et al*. stressed that people from low- and middle-income countries are challenged by unmet rehabilitation needs [46]; Jesus *et al*. reported that only 70% of global rehabilitation needs are low and middle countries [47]; however, only 3% of the entire population in these areas receive adequate rehabilitation service [48].

It is desired that telerehabilitation programs will bridge the gap and improve the healthcare quality offering. There is potential to introduce technology-orientated health awareness and services. The success of similar technology-based interventions during COVID-19, such as HealthAlert, MomConnect, and MalariaConnect, suggests that telerehabilitation could be effectively implemented [49-51]. All the interventions above give hope that telerehabilitation services have the potential to be implemented successfully within healthcare services. However, such implementations have serious financial implications, which can serve as a challenge for implementation in South Africa. In Nigeria, as an attempt to reduce the transmission of COVID-19, telerehabilitation was a recommended practice for continued care while adhering to the imposed restrictions for managing the pandemic [52]. Therefore, the few resources available can be explored, as evidenced by the findings of the present study and supported by Odetunde *et al*. [52]. A feasible strategy for implementing telerehabilitation in South Africa could be explored with the much-anticipated introduction of the National Health Insurance (NIH) in South Africa that can act as a mitigate the disparities of health services provided by public and private institutions [23].

CONCLUSION

Whilst conducting the study, the researcher found out that most of the healthcare professionals in the Elias Motsoaledi Municipality have little knowledge about telerehabilitation. The participants expressed that there are no rehabilitation centers in the communities. The healthcare professionals disclosed that they encourage patients with non-communicable diseases, such as diabetes and hypertension, amongst others, to exercise and eat healthy. However, there is no guarantee that the patients will follow through with the advice. There is a massive shortage of healthcare professionals such as Occupational therapists, Physiotherapists and Biokineticists who offer their services to patients who cannot afford medical aid and need help regarding managing non-communicable diseases like diabetes. There is a substantial need for education about telerehabilitation and its benefits in the rural areas of Limpopo, like the Elias Motsoaledi Local Municipality, for both patients and healthcare professionals.

The researchers recommend organizing workshops in rural healthcare facilities to educate healthcare professionals and patients of different ages, illnesses, conditions, and disabilities about telerehabilitation and its potential benefits. Future research should consider the perceptions of patients regarding telerehabilitation and the required efforts from patients' knowledge and perceived experiences. Additionally, there is a need for more equipment and resources, including man-power, to support the implementation of telerehabilitation in clinics. Therefore, investment opportunities in healthcare resources and facilities are required to implement telerehabilitation. Government could partner with private institutions for intervention challenges affecting the implementing telerehabilitation in South African healthcare facilities. Strategies, guideline and frameworks should be developed and rolled out demo-prototypes of telerehabilitation programs to test the viability and feasibility.

AUTHORS' CONTRIBUTION

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript

LIST OF ABBREVIATIONS

CBR = Community-Based Rehabilitation Matrix

PHC = Primary Health Care

ICT = Information and Communication Technology

NIH = National Health Insurance

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The approval to conduct the study was sought from the Biomedical Research Committee of the University of the Western Cape (BM22_6_41), South Africa. Additional permission from the Department of Health in the Limpopo province, Elias Motsoaledi municipality, was obtained before data collection (LP202304023).

HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Consent to record the interviews was obtained from the participants, and interviews were conducted in a secluded area for privacy as well as to make certain that the participants were comfortable.

STANDARDS OF REPORTING

COREQ guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data from the manuscript is available on reasonable request to the corresponding author [M.M].

FUNDING

The work reported herein was made possible through funding by the South African Medical Research Council through its Division of Research Capacity Development under the Bongani Mayosi National Health Scholars Programme from funding received from the Public Health Enhancement Fund / South African National Department of Health. The content hereof is the sole responsibility of the authors and does not necessarily represent the official views of the SAMRC. The SAMRC accepts no liability regarding this study.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the use of an Artificial Intelligence (AI) tool Claude. The tool was used to simplify statements and paraphrase some statements for clarity and readability purposes.

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