



www.bioinformation.net
Volume 21(6)



Research Article

Received June 01, 2025; Revised June 30, 2025; Accepted June 30, 2025, Published June 30, 2025

DOI: 10.6026/973206300211689

SJIF 2025 (Scientific Journal Impact Factor for 2025) = 8.478

2022 Impact Factor (2023 Clarivate Inc. release) is 1.9

Declaration on Publication Ethics:

The author's state that they adhere with COPE guidelines on publishing ethics as described elsewhere at <https://publicationethics.org/>. The authors also undertake that they are not associated with any other third party (governmental or non-governmental agencies) linking with any form of unethical issues connecting to this publication. The authors also declare that they are not withholding any information that is misleading to the publisher in regard to this article.

Declaration on official E-mail:

The corresponding author declares that lifetime official e-mail from their institution is not available for all authors

License statement:

This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. This is distributed under the terms of the Creative Commons Attribution License

Comments from readers:

Articles published in BIOINFORMATION are open for relevant post publication comments and criticisms, which will be published immediately linking to the original article without open access charges. Comments should be concise, coherent and critical in less than 1000 words.

Disclaimer:

Bioinformation provides a platform for scholarly communication of data and information to create knowledge in the Biological/Biomedical domain after adequate peer/editorial reviews and editing entertaining revisions where required. The views and opinions expressed are those of the author(s) and do not reflect the views or opinions of Bioinformation and (or) its publisher Biomedical Informatics. Biomedical Informatics remains neutral and allows authors to specify their address and affiliation details including territory where required.

Edited by P Kanguane

Citation: Agnihotri *et al.* Bioinformation 21(6): 1689-1692 (2025)

Telerehabilitation in India: From awareness to acceptance

Saurabh Agnihotri^{1,*}, Naveen Kumar Singh² & Nalina Gupta³

¹Department of Physiotherapy, Teerthanker Mahaveer University, Delhi Road, Moradabad - 244001, Uttar Pradesh, India;

²Department of Surgery, Teerthanker Mahaveer Medical College, Teerthanker Mahaveer University, Moradabad, India; ³MM College of Physiotherapy and Rehabilitation, Sadopur, Ambala, Haryana, India; *Corresponding author

Affiliation URL:

<https://www.tmu.ac.in>

<https://www.mmambala.org>

Author contacts:

Saurabh Agnihotri - E-mail: saurabh.mpt@gmail.com; physiotherapy_opd@tmu.ac.in; Phone: +91 8938856863

Naveen Kumar Singh - E-mail: dr.naveen.s@gmail.com; principal.medical@tmu.ac.in

Nalina Gupta - E-mail: nalinagupta0406@gmail.com; principal.physiotherapy@mmambala.org

Abstract:

Telerehabilitation is gaining prominence in improving healthcare access, especially in underserved regions. Therefore, it is of interest to evaluate the knowledge, attitudes and practices (KAP) of the general population in Western Uttar Pradesh, India. A cross-sectional survey of 455 individuals was conducted using a validated, Hindi-translated questionnaire. While only 40.7% were previously aware of telerehabilitation, 81.8% showed willingness to use it, particularly among younger, male and better-educated participants. Thus, the need for targeted awareness and digital inclusion strategies to enable equitable access to telerehabilitation across populations is reported.

Keywords: Telerehabilitation, knowledge-attitude-practice, telemedicine, digital literacy, public health, cross-sectional survey

Background:

Telerehabilitation, a branch of rehabilitative medicine enables the remote delivery of physiotherapy services through digital technologies, particularly benefiting patients in underserved regions [1]. It allows personalized treatment for various conditions, including musculoskeletal, neurological, cardiopulmonary and pediatric disorders, via internet-based systems, messaging services and audio/video calls [2]. Telerehabilitation has been shown to improve continuity of care and accessibility, particularly in resource- limited settings [3].

Studies have shown that home-based telerehabilitation provides clinical outcomes comparable to traditional face-to-face therapy, particularly in patients recovering from total knee arthroplasty [4]. It also promotes adherence and reduces overall healthcare costs [5], while eliminating geographical barriers to access [6]. India's national initiatives such as Sanjeevani and MANAS (Mental Health and Normalcy Augmentation System) have successfully integrated telerehabilitation into mainstream healthcare by offering remote consultations and mental health support especially during the COVID- 19 pandemic [7, 8]. Despite these advancements, digital illiteracy infrastructure limitation and cultural hesitation continue to obstruct widespread adoption of telerehabilitation [9]. Therefore it is of interest to report the knowledge, attitude and practice of telerehabilitation among the general population of Western Uttar Pradesh.

Methods and Materials:

Study design:

This was a cross-sectional observational study.

Study population:

The target population included residents of Western Uttar Pradesh, specifically focusing on individuals living in Moradabad and nearby districts. This demographic was chosen to provide insights into the telerehabilitation knowledge, attitude and practice (KAP) within this specific geographic area.

Source of data:

Data were sourced directly from the general population residing in Moradabad and adjacent districts.

Sample size:

Based on the assumption that 50% of the target population was knowledgeable about telerehabilitation, the sample size was calculated at 454 individuals using formula.

$$Z^2 pq/d^2$$

Where z is taken to be 1.96 for 95% confidence limits with p = 50% (anticipated knowledge level), q = 100 - p and d denoted the absolute error in precision which was 5%

Inclusion criteria:

- [1] **Age:** Participants above 18 years.
- [2] **Residency:** Residents of Moradabad and surrounding districts in Western Uttar Pradesh.
- [3] **Gender:** Both male and female participated in the study.

Exclusion criteria:

- [1] Participants unwilling to participate.
- [2] Participants unable to comprehend the questionnaire.

Procedure:

The study began with the development of a questionnaire, initially comprising 10 questions aimed at assessing the KAP of telerehabilitation among the general population in Western Uttar Pradesh.

Questionnaire development:

The development process of this self-designed questionnaire included multiple stages to ensure it was comprehensive, reliable and culturally relevant to the target population. The initial design consisted of 10 questions, distributed across three domains Knowledge, Attitude and Practice each aimed at capturing distinct aspects of the population's interaction with telerehabilitation. Reliability was confirmed by pilot testing (Cronbach's alpha=0.78). Translated into Hindi for cultural appropriateness, it was pre-tested on 20 participants.

Ethical considerations:

The study was approved by the Institutional Ethics Committee, College of paramedical Sciences, Teerthanker Mahaveer University (Approval No.: PM/ETHICAL/PT/2023/004).

Data collection:

Data collection was carried out by trained physical therapists who had also participated in the pre-testing phase of the study. The process took place in November and December 2023 in Bagadpur and other areas of Moradabad. Participants were approached at their homes or workplaces, where written informed consent was obtained prior to data collection. They were informed of their rights, including the option to withdraw from the study at any point during the interview. After completing the questionnaire, participants received information about the telerehabilitation services provided by the Physiotherapy Department of Teerthanker Mahaveer Hospital.

Data analysis:

Data analysis was done using Strata 16.0 software.

Table 2: Summary of Knowledge, Attitude and Practice (KAP) Responses and Their Statistical Association with Age, Gender and Education (Chi-square test, $p < 0.05$ considered significant)

KAP Domain	Item	Overall % (Yes)	Age	Gender†	Education‡
Knowledge	Heard about telerehabilitation	40.70%	Significant	Significant	Significant
Attitude	Prefer telerehabilitation	81.80%	Significant	Significant	Not Significant
Attitude	Easy to use	70.50%	Significant	Significant	Not Significant
Attitude	Face-to-face same as telerehab	30.70%	Significant	Not Significant	Not Significant
Attitude	Understand/explain easily	48.70%	Significant	Not Significant	Not Significant
Attitude	Suitable for pain-related emergencies	62.60%	Significant	Significant	Not Significant
Practice	Cost/time effective	74.20%	Significant	Significant	Not Significant
Practice	Wish to get relief via telerehab	63.10%	Significant	Not Significant	Not Significant
Practice	Easily approachable	78.70%	Significant	Significant	Significant
Practice	Will recommend to others	84.20%	Significant	Not Significant	Not Significant

Significant: $p < 0.05$, Not Significant: $p \geq 0.05$
K -Knowledge, A-Attitude, P - Practice

Results and Discussion:

A total of 455 individuals participated in the study. The majority (62.7%) were aged 18-30 years, followed by 34.0% in the 31-60 age group and 3.3% above 60 years. Males comprised 65.4% of the sample, while females represented 34.6%. In terms of education, 39.1% were graduates, 26.3% had completed senior secondary education and 5.7% were uneducated. Table 1 presents the demographic distribution). Only 40.7% of participants were previously aware of telerehabilitation; however 81.8% preferred it for consultations. Most found it easy to use (70.5%), cost and time efficient (74.2%) and accessible (78.9%). Furthermore, 84.2% indicated they would recommend it to others. The distribution of KAP responses is visualized in Figure 1.

YES - Agreed, NO - Disagreed, CAN'T SAY - Neutral/Unsure
K- Knowledge | A- Attitude | P - Practice

Chi-square analysis revealed significant associations between KAP domains and key demographic variables: Participants aged 18-30 years showed significantly higher awareness and more favorable attitudes and practices across all items. Male respondents were significantly more likely to report awareness, ease of use and preference for telerehabilitation. Those with higher education levels demonstrated greater awareness, approachability and confidence in telerehabilitation use. A summary of statistical associations is provided in Table 2. Items with statistically significant differences ($p < 0.05$) are indicated. Telerehabilitation provides an alternative mode of delivering

Table 1: Demographic profile of participants

Parameter	Frequency (n)	Percentage (%)
Age category		
18-30 years	285	62.7
31-60 years	155	34.0
More than 60 years	15	3.3
Gender		
Female	157	34.6
Male	298	65.4
Education		
Uneducated	26	5.7
Up-to matriculation	71	15.6
Senior Secondary	120	26.3
Graduate	178	39.1
Post Graduate	60	13.1

physiotherapy and rehabilitation services, improving access for patients beyond traditional clinical settings [1].

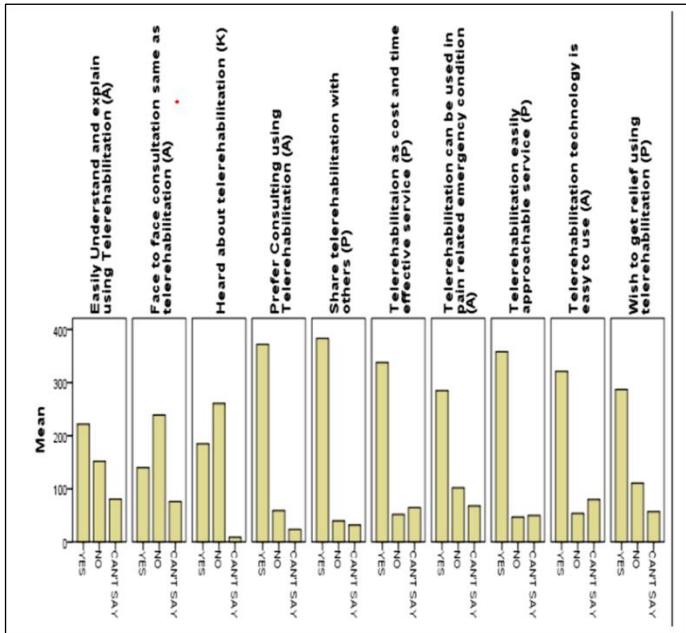


Figure 1: Knowledge, Attitude and Practice (KAP) Distribution Regarding Telerehabilitation
In this study, we examined the Knowledge, Attitude and Practice (KAP) of telerehabilitation among diverse demographic

groups in Western Uttar Pradesh. By analyzing awareness, attitudes and usage patterns across age, gender and educational backgrounds, the findings provide valuable insights into public perception and the challenges surrounding the broader adoption of telerehabilitation. The limited awareness of telerehabilitation highlights a significant knowledge gap, indicating the need for targeted education campaigns [10]. Nevertheless, the strong preference for telerehabilitation indicates a positive attitude toward adopting digital healthcare technologies [11]. Ease of use was another key factor in acceptance. Many respondents reported that telerehabilitation platforms were user-friendly, fostering confidence in digital interactions for healthcare delivery [12]. However, some skepticism remained, particularly regarding whether telerehabilitation could match the effectiveness of traditional face-to-face consultations [13]. Participants also acknowledged practical advantages, with most identifying telerehabilitation as both cost- and time-efficient [14]. Furthermore, the majority considered it an accessible and convenient service. Most respondents expressed willingness to share information about telerehabilitation with others, emphasizing its potential for organic growth and broader societal acceptance [15]. Demographic analysis revealed age-related differences in perception. Younger respondents (18-30 years) demonstrated greater familiarity with technology and digital tools, making them more receptive to telerehabilitation. This age group, often referred to as digital natives, has grown up with widespread access to mobile devices and internet services, which contributes to their adaptability and comfort with virtual platforms. Consequently, they were more likely to view telerehabilitation favorably, perceiving it as an effective and efficient alternative to traditional face-to-face consultations. Their openness to digital healthcare solutions underlines the importance of leveraging technology in health promotion strategies targeting younger populations [16, 7]. While gender differences were statistically insignificant, notable trends emerged. Male respondents appeared more confident in navigating telerehabilitation platforms and were more inclined to view these services as viable, especially in emergency contexts such as sudden pain episodes. This may be attributed to greater exposure to digital tools, a higher degree of comfort with technology use and more frequent engagement with health information through online channels. Prior studies have indicated that males often report higher levels of digital literacy and self-efficacy when using health-related technologies, which could explain their favorable perception of telerehabilitation accessibility and reliability during urgent health situations [16, 17]. Educational background played a significant role in shaping KAP. Respondents with higher education levels demonstrated greater awareness, confidence and preference for telerehabilitation services. This may be attributed to their increased exposure to academic and digital environments, which foster familiarity with technology-based healthcare solutions. Higher educational attainment is often associated with better

health literacy, critical thinking skills and a proactive approach to adopting new innovations, all of which contribute to the ease of use and acceptance of telerehabilitation. These findings align with earlier studies linking educational qualifications to greater digital health acceptance, reinforcing the need for targeted awareness efforts among less educated populations [12]. In summary, while the overall attitude toward telerehabilitation is positive, the study identifies crucial gaps in awareness and perceived effectiveness, especially among older adults, females and individuals with lower educational attainment. Addressing these disparities through public education, digital literacy initiatives and supportive policies will be essential to integrating telerehabilitation into mainstream healthcare systems effectively.

Conclusion:

Telerehabilitation was widely preferred for its accessibility, cost effectiveness and usability. Younger and more educated individuals exhibited greater readiness for digital rehabilitation services. Thus, the need for targeted interventions and supportive policies to bridge demographic disparities in telerehabilitation adoption is reported.

References:

- [1] An J et al. *Int J Environ Res Public Health*. 2021 **18**:6071 [PMID: 34199913]
- [2] Ownsworth T et al. *J Head Trauma Rehabil*. 2018 **33**:E33. [PMID: 29084100]
- [3] Ostrowska PM et al. *Healthcare (Basel)*. 2021 **9**:654. [PMID: 34072939]
- [4] Seron P et al. *Phys Ther*. 2021 **101**:pzab053. [PMID: 33561280]
- [5] Shukla H et al. *J Telemed Telecare*. 2017 **23**:339. [PMID: 26843466]
- [6] Lal H et al. *Indian J Orthop*. 2023 **57**:7 [PMID: 36660485]
- [7] Garg S et al. *J Family Med Prim Care*. 2020 **9**:4516. [PMID: 33209755]
- [8] Agarwal A et al. *Lancet Reg Health Southeast Asia*. 2022 **8**:100100. [PMID: 37384138]
- [9] Gandhi DB et al. *Neuro Rehabilitation*. 2025 **56**:48. [PMID: 39302387]
- [10] Cottrell MA et al. *Int J Telerehabil*. 2018 **10**:81. [PMID: 30588279]
- [11] Hersh WR et al. *Evid Rep Technol Assess (Summ)*. 2001 **24**:1. [PMID: 11252763]
- [12] Cimperman M et al. *Int J Med Inform*. 2016 **90**:22. [PMID: 27103194]
- [13] Appleby E et al. *Plos One*. 2019 **14**:e0225150. [PMID: 31714924]
- [14] Kairy D et al. *Int J Environ Res Public Health*. 2013 **10**:3998. [PMID: 23999548]
- [15] Polinski JM et al. *J Gen Intern Med*. 2016 **31**:269. [PMID: 26269131]
- [16] Wang MY et al. *Front Public Health*. 2023 **11**:1274080. [PMID: 38026371]
- [17] Brennan DM & Steege LM. *J Telemed Telecare*. 2008 **14**:55. [PMID: 18348747]