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Awareness, knowledge and practice of tele-rehabilitation in 2nd year post graduate cardiovascular and respiratory physiotherapy students

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Abstract
Background: The expansion of telecommunications through information technology has fundamentally transformed the landscape of medical management across the globe. This transformation is particularly evident in the domain of rehabilitation, where the integration of electronic media and information and communication technologies (ICT) has revolutionized the delivery of health services and information [2, 3]. Cardiovascular and pulmonary rehabilitation is a comprehensive intervention for secondary prevention of cardiovascular and pulmonary disease. Cardiac rehabilitation includes physical rehabilitation, controlling and monitoring the vitals of patient, improving the cardiorespiratory endurance, energy conservation techniques and designing rehab protocol accordingly. However, the present study aims to bridge this gap by evaluating the knowledge, awareness, and skills of CVRS physiotherapists towards telerehabilitation. This focus is pivotal in understanding the readiness and capability of future cardiovascular and respiratory physiotherapists to embrace and effectively implement telerehabilitation practices, thereby contributing to the broader application and success of these technologies in enhancing patient care and rehabilitation outcomes.
Methods: A Cross-sectional study was conducted on 45 2nd year Cardio-Vascular and Respiratory Physiotherapists and a self-made questionnaire was provided to them via google forms through emails and different social media platforms and their answers were recorded. Data were analyzed using descriptive analysis in MS Excel.
Results: The results showed that 64% of the total population is aware about tele-rehabilitation in CVRS Physiotherapy and 50% of them choose to rate their overall knowledge as somewhat knowledgeable, 45% as knowledgeable, 4% as not knowledgeable at all and 5% as very knowledgeable and 75% of participants had an opportunity to practice tele-rehabilitation in the past, and 25% never had the opportunity for it.
Conclusion: The results showed that although 2nd year cardiovascular and respiratory physiotherapy students have a moderate understanding of tele-rehabilitation, there are still large gaps in their structured knowledge and practical experience.

Keywords: Cardiovascular and respiratory physiotherapy, tele-rehabilitation, post graduate

Introduction

Technology has completely changed the field of medical rehabilitation in recent years [1]. The world has recently changed to using technology in practically everything, especially with regard after pandemic, and as a result, online and tele-rehabilitation have grown in popularity [1]. The expansion of telecommunications through information technology has fundamentally transformed the landscape of medical management across the globe. This transformation is particularly evident in the domain of rehabilitation, where the integration of electronic media and information and communication technologies (ICT) has revolutionized the delivery of health services and information [2]. Tele-rehabilitation is of utmost importance, as it remotely provides rehabilitation services with the help of information and communication technology [2]. Tele-rehabilitation service is found to be a user friendly, simplified access, low-cost technology [2]. Through recent advancements in technology clinicians are motivated to practice tele-rehabilitation and each family member to proactively assist patients in maintaining and enhancing their quality of life through continuous in-home rehabilitation programs [3]. Cardiovascular and pulmonary rehabilitation is a comprehensive intervention for secondary prevention of cardiovascular and pulmonary disease. Cardiac rehabilitation includes physical rehabilitation, controlling and monitoring the vitals of patient, improving the cardiorespiratory endurance, energy conservation techniques and designing rehab protocol accordingly. Telerehabilitation encompasses two primary modalities: 'contemporaneous', wherein therapists and patients interact in real-time but from different locations, and 'non-contemporaneous', which involves asynchronous 'store and forward' data transfer, including digital images, video clips, and other telecommunications tools [2]. Technology plays an important role in tele-rehabilitation, with wearable, virtual reality, smartphone apps, and artificial intelligence [4]. By employing this innovative technique, physiotherapists can now provide patients with customized care in the comfort of their own homes, expanding the practice's extension outside of traditional clinic environments [4].

Exercises and treatment plans can be modified to meet the specific needs of the patient, the available space, and the available resources in order to customize physiotherapy treatments for home situations [4]. Patients and physiotherapists work together to develop rehabilitation programs that are simple to implement into everyday life [4]. However, the present study aims to bridge this gap by evaluating the knowledge, awareness, and skills of CVRS physiotherapists towards telerehabilitation. This focus is

pivotal in understanding the readiness and capability of future cardiovascular and respiratory physiotherapists to embrace and effectively implement telerehabilitation practices, thereby contributing to the broader application and success of these technologies in enhancing patient care and rehabilitation outcomes.

Methodology: The present study was a cross-sectional study conducted across 45 2nd year Cardiovascular and Respiratory Physiotherapy students in various colleges in Mumbai and Navi Mumbai. Sampling was performed using snow-ball sampling. The sample size was determined using Open Epi software (version 3) keeping the confidence level at 95%.

Ethical approval for the study was obtained from the Institutional Ethics Committee of Lokmanya Tilak College of Physiotherapy prior to the commencement of data collection. All participants were informed about the purpose and procedure of the study and informed consent was obtained. Participant information and collected data were kept strictly confidential throughout the research process.

The study aimed to assess Awareness, Knowledge and Practice of Tele-Rehabilitation in 2nd year Cardiovascular and Respiratory Physiotherapy Students.

Participants were excluded if they have other electives as their speciality, Academicians and Clinicians, 1st year post graduate physiotherapy students and those who are not willing to participate.

Statistical Analysis and Results

The statistical analysis was performed using Microsoft Excel 365 (office).

In the first section of the Questionnaire, the Demographics, 45 participants have participated out of which 13% are males and 87% are females within the age group from 22 years to 28 years.

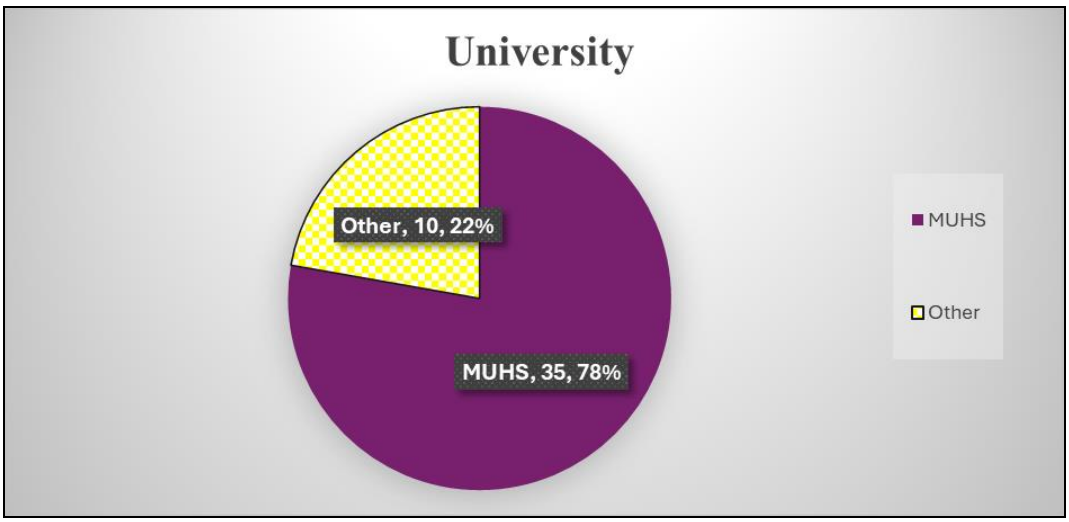

Fig 1:

The following figure explains whether the participant has studied from MUHS or any OTHER university, 78% of them have studies from MUHS, whereas 22% have studied from OTHER.

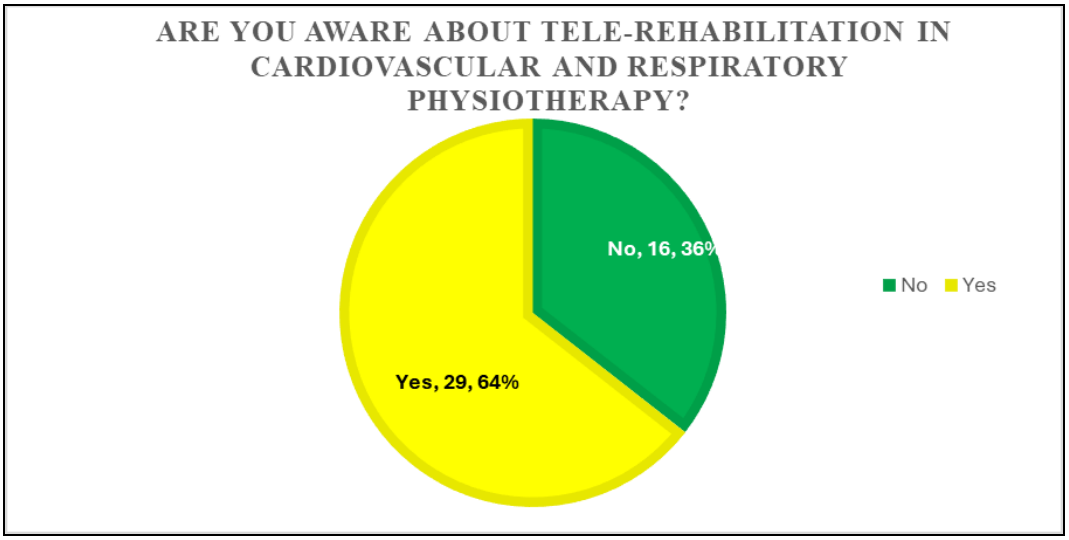

Fig 2:

Figure 2 explains how much percentage of participant is aware about tele-rehabilitation in CVRS Physiotherapy. 64% of the total population is aware about tele-rehabilitation in CVRS Physiotherapy and 36% of them don't.

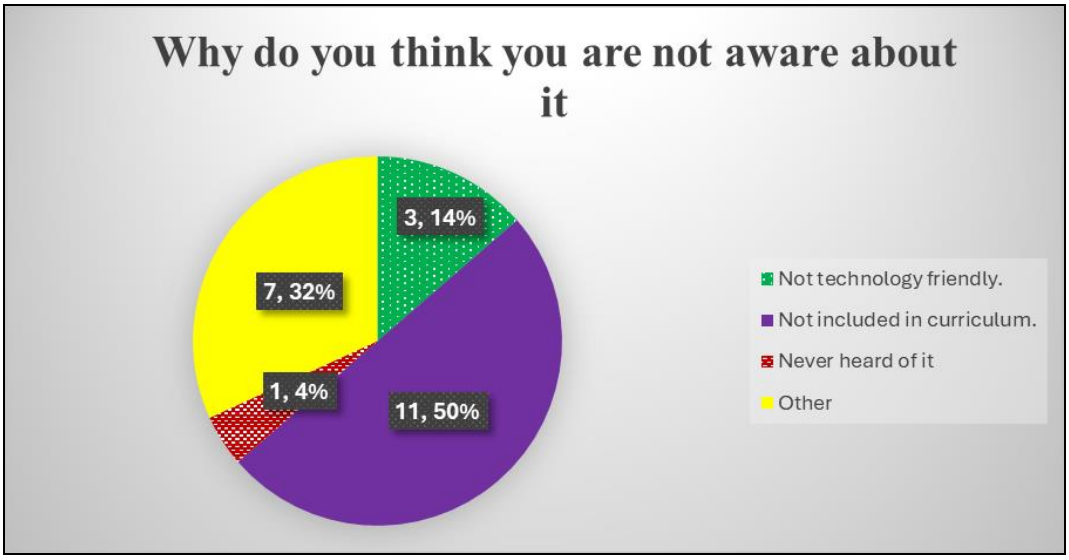

Fig 3:

Figure 3 explains the reason of why they are not aware about it. 50% are unaware because it is not included in curriculum, 14% are not aware because they are not technology friendly, 4% because they have never heard of it, and the rest 32% because of other reasons.

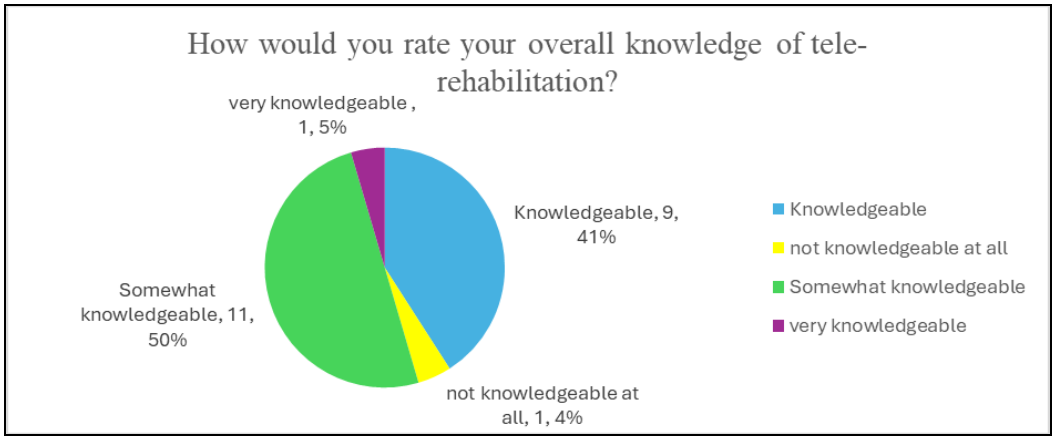

Fig 4:

Figure 4 explains how the participants rate their overall knowledge on tele-rehabilitation. 50% of them choose somewhat knowledgeable, 49% as knowledgeable, 4% as not knowledgeable at all and 5% as very knowledgeable.

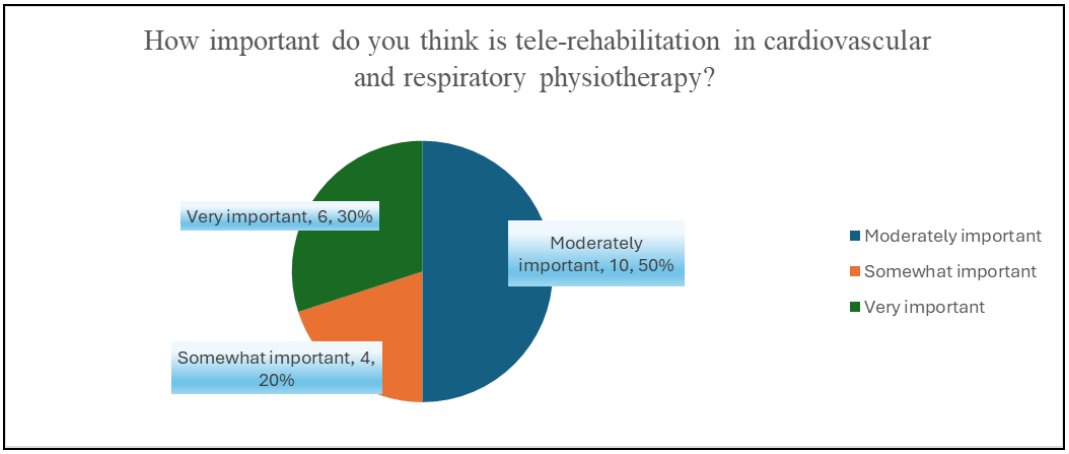

Fig 5:

Figure 5 explains whether tele-rehabilitation is important in CVRS Physiotherapy. 6 of them think it is very important, 4 of them think it is somewhat important, 10 of them think it is moderately important and only one think that it is not important at all.

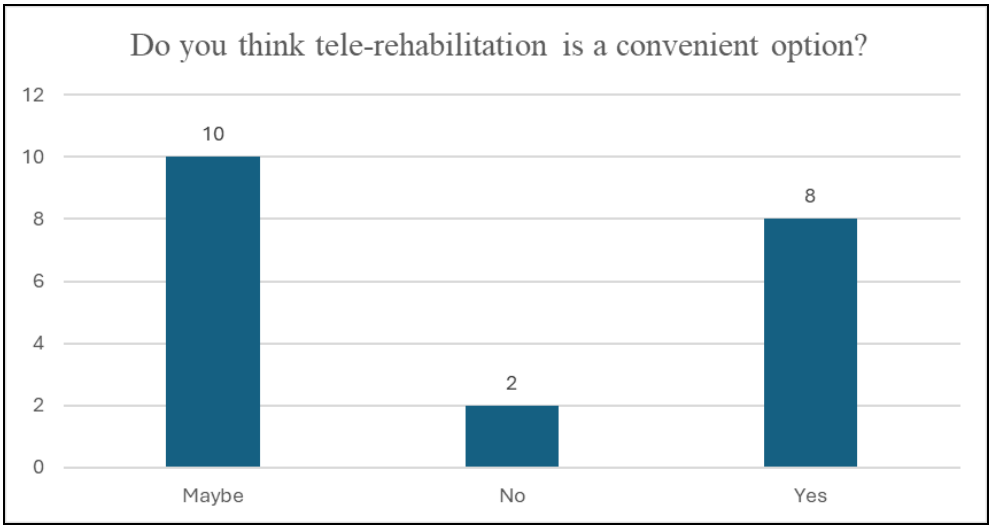

Fig 6:

Figure 6 explains whether participants think about convenience of tele-rehabilitation. 8 of them think 'yes', 2 thinks 'no' and 10 thinks 'maybe'.

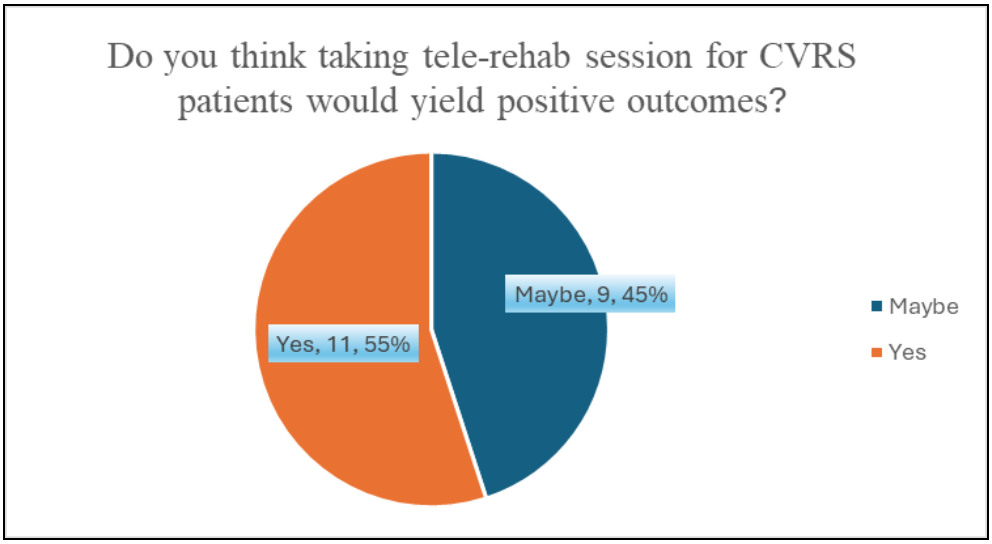

Fig 7:

Figure 7 is about positive outcomes of tele-rehabilitation, 11 participants think 'yes' it would yield positive outcome, none of them thinks of 'no' while 9 are not sure and chose 'maybe'.

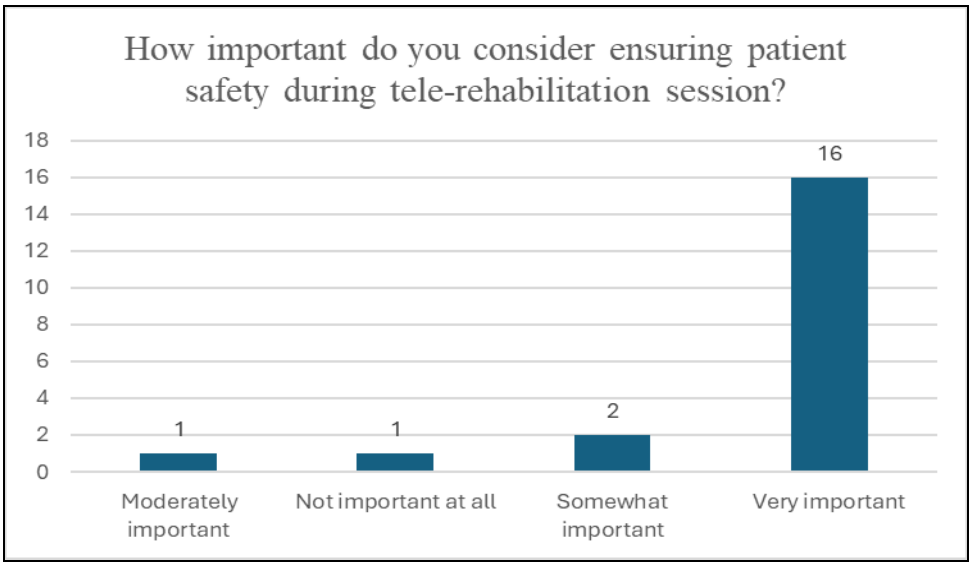

Fig 8:

It explains how important do therapist think is the safety of the patient during the online session, 16 say it is very important, 1 say it is moderately important, 2 say somewhat important and 1 of them say it is not important at all.

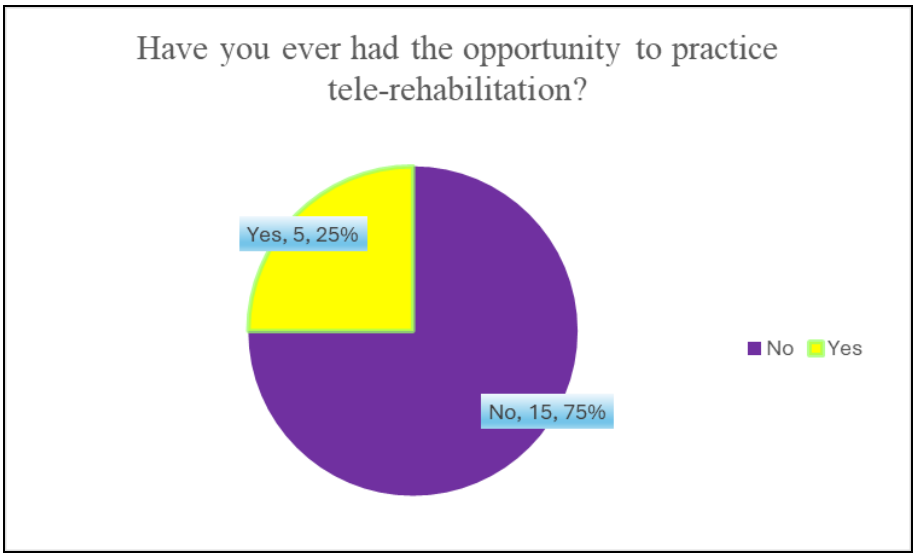

Fig 9:

Figure 9 explains that 75% of participants had an opportunity to practice tele-rehabilitation in the past, and 25% never had the opportunity for it.

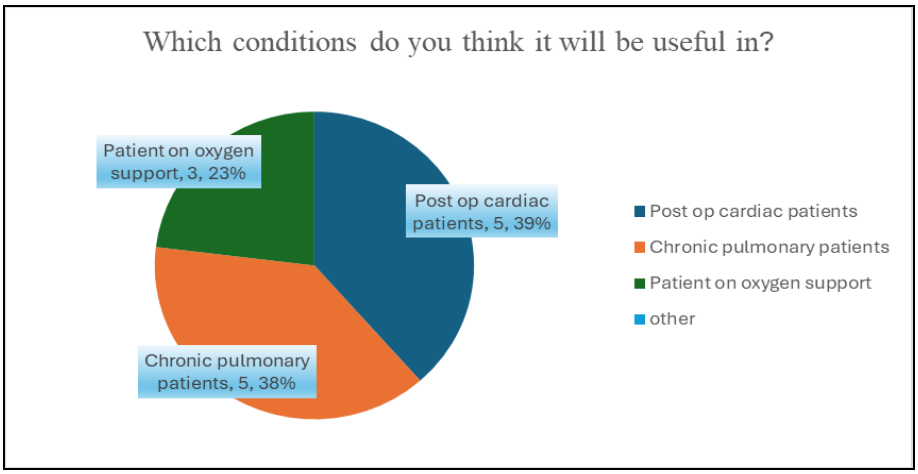

Fig 10:

Figure 10 explains the question about what conditions do they think will tele-rehabilitation be useful in? 38% think that it is useful in chronic pulmonary patients, 39% think its useful in post-op cardiac conditions, 23% think of patient on oxygen support.

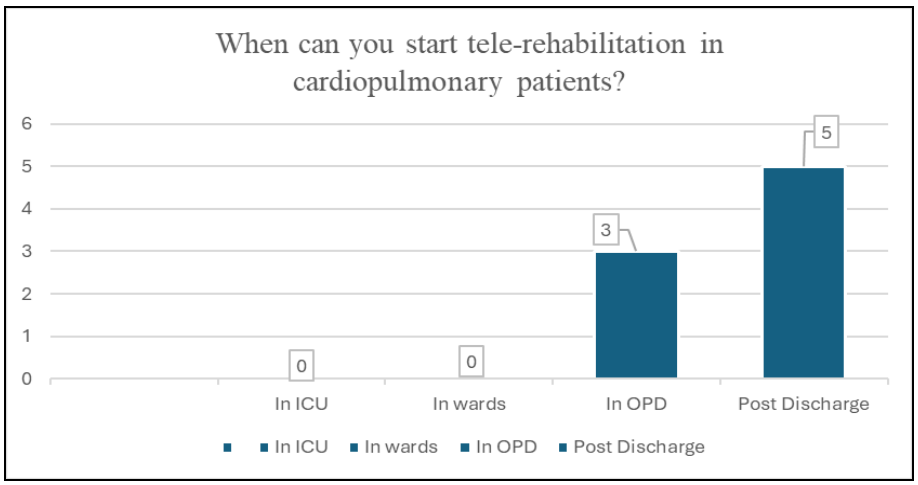

Fig 11:

Figure 11 explains the question when can you start tele-rehabilitation sessions, 5 of them choose post discharge, 3 of them think they can start it when in OPD and none chose to start it in wards and in ICU.

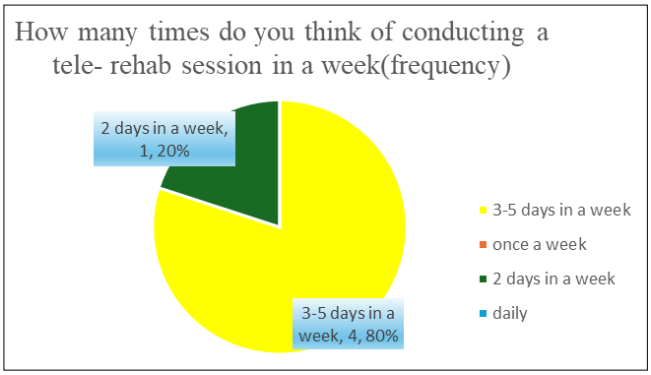

Fig 12:

Figure 12 explains a question about the frequency of tele-rehabilitation, 80% of them choose to conduct the sessions for 3-5 days in a week, 20% of them choose to conduct it 2 days in a week while none of them choose to conduct it daily or even once in a week.

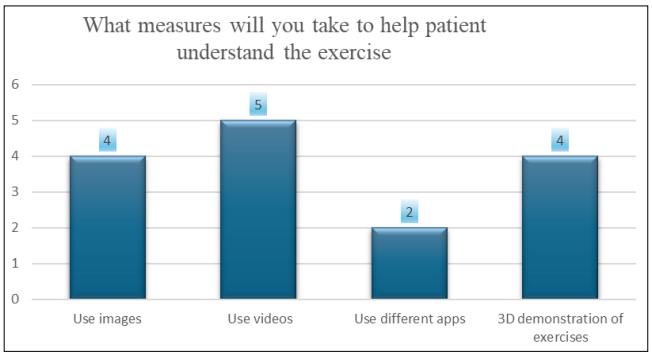

Fig 13:

Figure 13 explains the measures physiotherapist would like to take to help patients understand the exercises better during online sessions. 5 will be using videos, 4 will be using 3D demonstration of exercises, 4 will take help of images, 2will be using different apps.

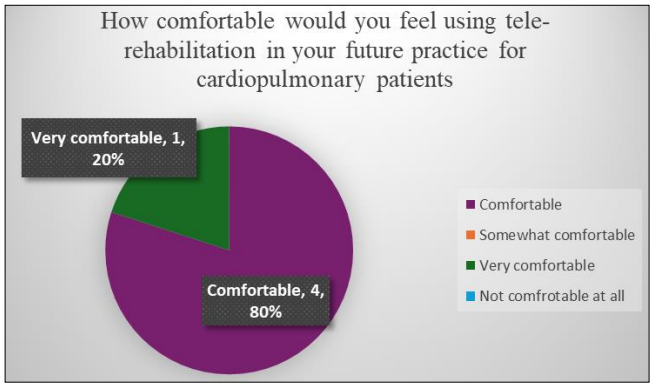

Fig 14:

Figure 14 asks whether the participants would feel comfortable using tele-rehabilitation in their future practice for cardiopulmonary patients and 80% feel they would be comfortable, 20% think they will be very comfortable while none of them think they are not comfortable at all.

Discssion: The present study aimed to assess the awareness, knowledge, and practice of tele-rehabilitation among 2nd - year PG students in CVRS Physiotherapy. The findings show that although the majority of participants (64%) said they were aware of tele-rehabilitation, there are still large gaps in their exposure to structured knowledge and real-world applications / practical use. The results are consistent with past studies that show physiotherapy professionals and students' awareness of tele-rehabilitation is growing gradually but is still uneven because of a lack of opportunities for practical training and curriculum inclusion. For instance, a study by Cottrell *et al*. concluded that even though tele-rehabilitation is seen as an effective approach, its best implementation in clinical practice is hampered by gaps in formal education and training [1]. A significant percentage of participants (50%) pointed to their ignorance to the curriculum's lack of tele-rehabilitation. This result is in line with research conducted globally, which has shown that faculty inexperience and curriculum design are obstacles to incorporating digital health into physiotherapy education [3] Therefore, adding organised tele-rehabilitation modules, particularly in cardiac rehabilitation, could improve future professionals' readiness. The majority of students assessed their perceived knowledge levels as "somewhat knowledgeable" or "knowledgeable," but only one said they were "very knowledgeable." According to this self-evaluation, there was little opportunity for practical application of theoretical principles. Previous studies also indicate that confidence in tele-rehabilitation practice improves significantly after hands-on training and exposure to simulated patient interactions [4]. The majority of students agreed that tele-rehabilitation is moderately to highly relevant when it comes to cardiopulmonary care. This is consistent with previous research showing that tele-rehabilitation has been successful in enhancing quality of life, functional outcomes, and exercise adherence in cardiac and pulmonary populations [5-7]. However, the cynicism expressed in answers like "maybe" about results and convenience raises the possibility that students will need more proof and practical experiences to understand its effectiveness. 16 individuals assessed patient safety as "very important," indicating that it is a high priority. This supports results from earlier research that highlight the significance of patient education, well-defined protocols, and risk management in the delivery of tele-rehabilitation [8]. Just 29% of participants had any experience with tele-rehabilitation, which emphasises the lack of practical opportunities. Prior research has shown that practical obstacles, like access to technology, training, and supervision, are important factors that determine whether or not students can successfully use tele-rehabilitation in their professional careers [9, 10]. Lastly, in response to a question concerning future practice, over 50% of the participants said that they would be open to integrating tele-rehabilitation into their work, albeit to differing degrees of comfort. This indicates that physiotherapy students are becoming more receptive to digital health strategies, so long as they have access to organised instruction, helpful technology, and institutional support. Overall, this study emphasises that although tele-rehabilitation education is well known, it is urgently needed to be incorporated into physiotherapy

curriculum, especially in specialities like respiratory and CVRS physiotherapy where its use is most significant. To close the gap between awareness and effective application, future initiatives should concentrate on supervised tele-rehabilitation practice, simulations, and structured training. The current study investigated 2nd -year postgraduate students with a focus on cardiovascular and respiratory physiotherapy's awareness, understanding, and use of tele-rehabilitation. The results showed that although 64% of students knew about tele-rehabilitation, only few had thorough understanding of or hands-on experience. These findings are consistent with a larger worldwide trend in which awareness is rising but actual use is still constrained by infrastructure and educational obstacles. The fact that half of the participants who were not aware of the situation blamed their ignorance on the lack of curricular integration highlights how important academic training is in forming competencies. Mbada *et al*. found similar results, reporting that Nigerian physiotherapy students had a modest awareness of telerehabilitation but considerable knowledge gaps. They also anticipated that telerehabilitation would be more fully integrated into future practice [11]. Similarly, despite 78% of Indian physiotherapists being aware of telerehabilitation, Gurman *et al*. discovered that just 21% had used it in their practice, indicating a gap between knowledge and application [12]. The majority of students in the current study believed that tele-rehabilitation was somewhat to very important in cardiopulmonary rehabilitation, despite their lack of experience. The effectiveness of telerehabilitation in improving functional outcomes, adherence, and patient satisfaction across cardiopulmonary populations is supported by evidence from scoping reviews and systematic studies [13, 15]. Seid *et al***.** highlighted that post-COVID-19 respiratory telerehabilitation was both feasible and effective, improving capacity and reducing disability [15]. These similarities confirm that students are prepared to embrace the clinical benefits of tele-rehabilitation when accompanied by structured exposure. The overwhelming concern for patient safety—89% of respondents rated it as "very important" or "moderately important"—was a significant finding. This focus is reflected in international literature, which views safety, monitoring procedures, and ethical issues as necessary conditions for broad adoption [14]. This issue might be resolved by include risk management, standardised procedures, and patient education in training courses. About 29% of participants had any prior experience with tele-rehabilitation in terms of practice. Limited practice opportunities have been extensively documented as a hindrance in physiotherapy education across the globe [11, 12]. Enhancing competency may involve integrating telehealth platforms into curricula, encouraging supervised digital consultations, and simulating tele-rehabilitation sessions. Future physiotherapists need to be prepared with tele-assessment, tele-monitoring, and tele-exercise skills to address changing healthcare demands, according to the chapter by Kaur *et al*. [14]. The generational ease with digital technology is reflected in the students' optimism on the use of films, 3D demos, and apps as aids. This supports the finding by Mbada *et al*. that students studying physiotherapy have high expectations for the use of technology in healthcare because they are digital natives [11]. However, their confidence in applying theoretical knowledge to clinical tele-practice may continue to be low in the absence of mentorship and structured modules. Overall, this study reveals a significant gap: although students acknowledge the benefits of tele-rehabilitation in cardiac physiotherapy, their lack of exposure and understanding jeopardises its successful application. We advise, incorporating tele-rehabilitation modules into postgraduate programs, holding supervised and simulated tele-rehabilitation practice sessions, and exposing students to interdisciplinary telehealth platforms in accordance with international literature.

These programs will guarantee that physiotherapists of the future are suitably equipped to provide safe, efficient, and technologically advanced cardiovascular and respiratory rehabilitation services.

Clinical Importance

Bridging Gaps in Access: TR offers continuity of care for patients who cannot attend in-person sessions, especially in cardiopulmonary rehabilitation where regular monitoring is crucial.

Patient-Centered Care: Emphasis on patient safety, structured protocols, and education ensures quality outcomes even outside clinical settings.

Enhancing Outcomes: Evidence supports improvements in functional capacity, adherence, and quality of life in cardiac and respiratory populations through tele-rehabilitation.

Digital Competency: Training students in tele-rehabilitation prepares them for a healthcare system that increasingly integrates digital health, making them competent and versatile clinicians.

Crisis-Ready Rehabilitation: The COVID-19 experience highlights tele-rehabilitation as a sustainable alternative during pandemics or in remote areas with limited access to specialized services.

Future Scope

Curriculum Integration: Incorporating structured tele-rehabilitation modules, simulations, and supervised practice into physiotherapy programs.

Skill Development: Focus on tele-assessment, tele-monitoring, and tele-exercise prescription to prepare future physiotherapists for hybrid healthcare models.

Technology Innovation: Use of AI, wearable devices, mobile apps, and 3D interactive tools to enhance patient engagement and monitoring.

Research Expansion: Multi-institutional studies and longitudinal research to validate effectiveness, cost-efficiency, and patient safety in diverse populations.

Policy and Standardization: Development of national guidelines, ethical frameworks, and standard operating procedures for safe and efficient implementation.

Limitations

This study has certain limitations that should be acknowledged.

First, the results may not be relevant to students in other specialities or institutions due to the limited sample size (n=45) and restriction to 2nd -year postgraduate students in cardiovascular and respiratory physiotherapy.
2nd, practical exposure to tele-rehabilitation was evaluated based on participants' self-perceptions rather than an objective evaluation.
Future studies with larger, multi-institutional samples, mixed-method approaches, and longitudinal follow-up would provide a more comprehensive understanding of tele-rehabilitation competencies among physiotherapy students.

Conclusion

This study shows that although 2nd -year cardiovascular and respiratory physiotherapy students have a moderate understanding of tele-rehabilitation, there are still large gaps in their structured knowledge and practical experience. The results are consistent with worldwide research that highlights two major implementation obstacles: a lack of training opportunities and restricted curriculum inclusion. Crucially, students emphasised patient safety, recognised the usefulness of tele-rehabilitation in cardiac care, and indicated a desire to include digital platforms into their future work.
The incorporation of tele-rehabilitation into postgraduate curricula, including simulation-based learning, supervised teleconsultations, and interdisciplinary exposure to telehealth platforms, must be given top priority in physiotherapy education in order to capitalise on this preparedness. Improving access to rehabilitation and equipping the next generation of healthcare professionals to provide safe, efficient, and patient-centred care in an increasingly digital environment need strengthening knowledge and practical expertise in this area.

Conflict of Interest

None

Sources of Funding

None

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Abbreviations: CVRS- Cardiovascular and Respiratory Sciences, ICT – Information and Communication Technology, PG – Post Graduate, TR- Tele-Rehabilitation, OPD- Out Patient department, ICU- Intensive Care unit

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