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PHYSIOTHERAPISTS BARRIERS OF DELIVERING CARDIOPULMONARY REHABILITATION FOR PATIENTS WITH HEART FAILURE: A CROSS-SECTIONAL STUDY

Dr. Aisha Ijlal[1]*, Dr. Hajra Kanwal[2], Dr. Warda Farooq[3], Dr. Shafiat Jalalani[4], Dr. Talha Iqbal[5], Dr. Nida Waheed[6], Dr. Syed Uzair Mahmood[7], Dr. Aqsa Faiz[8]

[1*]Doctor of physical therapy, Jinnah Sindh medical university (Department of Physiotherapy) Email: aishaijlal12@gmail.com, Orcid: 0009-0008-9440-0377, Contact number: +923132510169 Address: 74800, Karachi Pakistan.
[2]Doctor of physical therapy, Jinnah Sindh medical university, (Department of Physiotherapy), EMAIL: hajrakanwal19@gmail.com, ORCID ID: 0009-0007-9453-8838
[3]Doctor of physical therapy, Institute: Jinnah Sindh medical university, (Department of Physiotherapy), Email: wardafarooq14@gmail.com, Orcid: 0009-0003-5723-334X
[4]Doctor of Physical Therapy, Jinnah Sindh medical university, (Department of Physiotherapy), sjalalani@gmail.com, 0009-0004-7026-7373
[5]Doctor of physical therapy, Jinnah Sindh medical university,(Department of Physiotherapy), talha.qbal21750@gmail.com, 0009-0004-9215-7685
[6]Doctor of physical therapy, MSPT, Institute of physical therapy and rehabilitation, JSMU, Contact: 03323962257
Email: nida.waheed@jsmu.edu.pk, Orcid id: 0009-0003-5910-1199
[7]Public Health Specialist, SHINE Humanity, MD, MPH, CPH, FRSPH, Queen's University of Belfast, Email: smahmood01@qub.ac.uk, ORCID = 0000-0003-0686-6625
[8]Doctor of physical therapy, Ms in Neuro Musculoskeletal, HOD/Principal at South city institute of physical therapy and rehabilitation Dr. Aqsa's ORIC: 0009-0001-8998-6309, aqsa.faiz@hotmail.com

***Corresponding Author:** Dr. Aisha Ijlal
*Doctor of physical therapy, Jinnah Sindh medical university (Department of Physiotherapy) Address: 74800, Karachi Pakistan. Email: aishaijlal12@gmail.com, Orcid: 0009-0008-9440-0377, Contact number: +923132510169

ABSTRACT

Heart Failure (HF) poses a significant global health burden, necessitating effective management strategies like Cardiac Rehabilitation (CR) programs. However, low participation rates persist due to various barriers, highlighting the need for understanding physiotherapists perspectives to improve CR utilization. This study aims to assess physiotherapists perceptions of CR and identify barriers they face in providing CR to HF patients in Pakistan. A cross-sectional study involving 200 physiotherapists in Pakistan was conducted, utilizing a questionnaire to assess their perceptions of CR, preferred delivery methods, perceived barriers, and factors influencing referral decisions. Findings reveal that 88% of physiotherapists believe CR improves fitness, with 75% acknowledging its effectiveness in reducing breathlessness. They prefer hospital-supervised programs (75%) focusing on weight and stress management and medication information. Factors influencing CR

referrals include low exercise tolerance (80%), patient education (78%), declining activity levels (77%), fatigue (71%), and breathlessness-related mobility issues (70%). Common barriers to CR referrals include lack of standardized protocols (73%), patient refusal and skepticism (73%), limited CR center availability (71%), and shortage of experienced staff (71%). Despite positive perceptions of CR, barriers such as standardized referral protocols, limited center availability, and staff shortages hinder its utilization. Addressing these challenges could enhance CR participation, improve patient outcomes, and mitigate the HF burden in Pakistan.

Keywords: heart failure; barriers; cardiopulmonary rehabilitation; physiotherapists; Pakistan.

1. INTRODUCTION

Heart failure (HF) is a significant worldwide health problem characterized by the hearts incapacity to effectively circulate blood to meet the metabolic needs of the body various tissues and organs..[1] Over the past two decades, HF has maintained its status as a common disease, imposing significant morbidity and mortality worldwide.[1] Of concern is the fact that majority of fatalities resulting from cardiovascular diseases are concentrated in low and middle income countries (LMICs), accounting for 80% of such deaths., rendering HF a leading global cause of suffering and death.[2] The risk of developing HF looms large, with a lifetime risk ranging between 26% and 40% for adults reaching the age of 45. Although HF has historically been associated with older adults, there is a growing trend of younger individuals being diagnosed with this condition in recent years.[3] Globally, the prevalence of HF exceeds 26 million cases, inflicting substantial healthcare costs on societies.[4] To address the mounting challenges posed by HF, cardiac rehabilitation (CR) programs have surfaced as a comprehensive outpatient strategy for secondary prevention and lifestyle modifications.

The symptoms of HF can manifest variably, appearing suddenly or evolving gradually over weeks or months, including dyspnea, fatigue on exertion, dependent edema, dizziness, chronic cough, wheezing, palpitations, anxiety, and depression. HF often arises from a convergence of heart conditions, including coronary heart disease, atherosclerosis-induced angina or heart attacks, high blood pressure, cardiomyopathies, arrhythmias, valve issues, atrial fibrillation, and congenital heart abnormalities.[5] Consequently, individuals with HF experience a marked decline in their ability to carry out daily activities, leading to a deterioration in their quality of life and an elevated risk of hospitalization.[6]

Engaging in CR programs is proven to significantly enhance the quality of life, functional capacity, exercise performance, and reduce hospitalizations among HF patients, attributed to improvements in cardiorespiratory fitness.[7] Cardiac Rehabilitation Program (CRP) is an essential non pharmacologic treatment plan for HF patients.[1] Cardiac Rehabilitation Program include disease education, exercise administration, lifestyle changes, psychosocial and nutritional counseling for cholesterol, hypertension, obesity, diabetes and smoking.[7] Cardiac Rehabilitation (CR) consists of three phases: Phase I begins in the hospital, providing initial stabilization and education; Phase II takes place in outpatient settings, emphasizing structured exercise and education; Phase III is a lifelong commitment to self-care, encouraging continued exercise and heart healthy habits to ensure lasting well-being for those with heart related conditions. These phases collectively support patients on their journey to recovery and long-term heart health.[8] Recognized as a vital non-pharmacological HF management strategy, CR programs entail personalized exercise regimens that include aerobic exercises, strength training, and high intensity interval training.[9] Individuals experiencing heart failure: those with reduced ejection fraction (HFrEF) and those with preserved ejection fraction (HFpEF) both see improvements in health related QOL and aerobic fitness with an improvement in peak VO_2max.[7]

Before beginning an exercise program for CR, patients with HFrEF (left ventricular ejection fraction of 35%) have been classified as high-risk individuals and subject to risk assessment by medical professionals. [9] Many doctors still do not suggest exercise-based CR to patients with HF due to the myth that exercise can be harmful to those with HF.[8,9] Typically, "physician supervised" approaches are used to establish rehabilitation programs. Along with center-based CR, there is growing evidence

of CR delivery models, such as CR conducted at home and CR based on electronic devices or mobile technology. Depending on the particular setting or context in which cardiac rehabilitation is carried out, including alternatives like in hospital, ambulatory, outpatient services, home based, supervised, or unsupervised settings, the impact may vary.[8,9] However, despite the compelling evidence favoring CR, its uptake among HF patients remains notably low.[10] According to various studies, multiple barriers have been identified in a patient's willingness to opt for CR. These include lack of physician referral,[8,14] lack of transportation,[11,14] nonexistence of Rehabilitation Centers,[8,15] poor funding for cardiac rehabilitation,[5]inadequate skills of therapist,[8,10] high-cost,[8,11] lack of support from family,[8] lack of awareness, Patient's lack of interest,[11,15] and Socioeconomic status.[16] Other obstacles were patient's comorbidities,[1] geographic and psychological barriers.[12] Recruitment and enrollment of HFrEF patients also faced significant barriers, with only 17% of hospitalized patients participating in cardiac rehabilitation.[13]

A Cardiac Rehabilitation (CR) team comprises various healthcare professionals collaborating to provide comprehensive care to cardiac patients. This multidisciplinary team includes physicians, nurses, physiotherapists, nutritionists, psychologists, social workers, pharmacists, exercise physiologists, and rehabilitation specialists. Their combined expertise addresses physical, emotional, nutritional, and social aspects of patient recovery, enhancing rehabilitation success and quality of life.[1,7]

Since; physiotherapists play a crucial role in cardiac rehabilitation for heart failure patients. They design personalized exercise programs that improve cardiovascular fitness, strength, and endurance. Additionally, they educate patients on heart healthy lifestyles, ensuring better adherence to medication and dietary guidelines. By closely monitoring progress and providing emotional support, physiotherapists contribute significantly to enhancing the overall quality of life for heart failure patients. Therefore, this study particularly investigates the barriers faced by physiotherapists in Cardiac Rehabilitation Programs (CRP) in Pakistan, aiming to enhance participation among Heart Failure (HF) patients. By addressing these challenges systematically, the research aims to improve patient care, outcomes, and quality of life in the HF population, aligning with global efforts to reduce HFs burden.

2. METHODS:

2.1 Study Design

The study design was Cross Sectional Study, the study setting was public, private and public private tertiary care hospital setup. The duration of the study was six months. From August 2023 till February 2024. Regarding sampling technique, convenience sampling was used in this study. For inclusion criteria the participant must be a physiotherapy (DPT) graduate or at least six months of prior clinical exposure. The exclusion criteria include the participants who have not given an informed consent and those who have no history of dealing with cardiopulmonary rehabilitation in a clinical setting.

2.2 Sample Size

The sample size was determined based on the replication from previously conducted study on "Barriers to Establishing Outpatient Cardiac Rehabilitation in the Western Region of Saudi Arabia: A Cross-Sectional Study" (Khushhal, A., & Alsubaiei, M.). The final sample size comprised 200 physiotherapists, ensuring the integrity and reliability of the dataset for analysis and interpretation.

2.3 Data Collection

Participants were briefed on the study objectives before completing a questionnaire featuring multiple choice questions on a 5-point Likert scale. The questionnaire comprised three sections: demographics,

perceptions of CR components, effectiveness, and delivery methods, and factors influencing referral decisions. Data was collected via a Google Form questionnaire after obtaining written consent from eligible participants.

2.4 Data Analysis

SPSS 26.0 was utilized for data analysis, reporting mean with SD or median with IQR for quantitative variables, and proportions for qualitative variables. Chi square tests were conducted as needed, with a significance threshold set at $p < 0.05$.

2.5 Ethical Consideration

The study obtained IRB approval from Ziauddin University and ensured ethical compliance through informed consent, confidentiality, voluntary participation, disclosure of conflicts of interest, respect for participants, and data security measures.

3. RESULT

In order to investigate physiotherapists perception of cardiac rehabilitation and to identify the barriers PTs face when it comes to providing CR to Heart Failure patients, we surveyed 200 physiotherapists. Out of which the respondents were 66% females and 34% males. 58% were physiotherapy graduates while 42% were senior physiotherapist, and majority (72%) of them were working in a tertiary care setup and those were mostly (47%) private setup. The higher percentages (31%) of physiotherapists have 1 to 2 years of experience or more than 5 years (24%) of clinical experience dealing with Heart failure patients.

3.1 Perception on Referral of Heart failure patients to Cardiac rehabilitation

According to this survey of physiotherapist, the majority (88%) strongly believed that cardiac rehabilitation (CR) could significantly improve the physical fitness of heart failure (HF) patients. Likewise, a substantial percentage (75%) felt that CR could reduce breathlessness in HF patients. 80% PTs also concurred that CR could improve palpitations and reduce fatigue in HF patients. Moreover, most PTs (86%) agreed that CR could enhance daily functioning in HF patients, and a considerable portion (81%) believed it could reduce hospital readmission rates. These findings highlight the favorable opinions of PTs regarding the potential benefits of CR for HF patients.

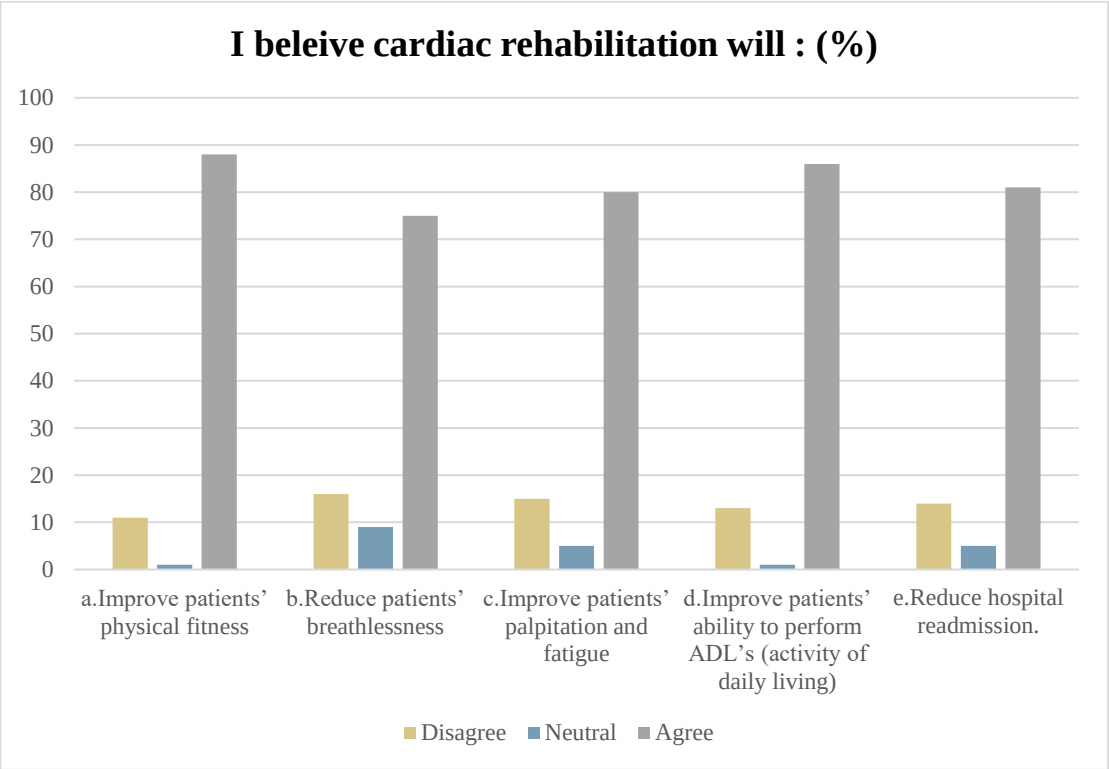

Fig.1.1, Perception on Referring Patients with Heart Failure to Cardiopulmonary Rehabilitation

3.2 Perception on Mode of Delivery and Component of Cardiac rehabilitation

In our survey involving physical therapists, it was overwhelmingly clear that 75% PTs believed the most effective way to deliver cardiac rehabilitation (CR) programs is through hospital supervised programs, with 35% showing a preference for online programs with healthcare provider support. Conversely, home programs were the least favored, chosen by only 25% of the therapists. These preferences align with their perceptions of CR components, where (82%) considered weight management crucial, followed closely (79%) by emphasizing stress management, and 78% highlighting the importance of information about medications. Similarly, a substantial percentage (77%) recognized the significance of symptoms management, information about heart failure disease (77%), and smoking cessation (75%) as integral components of CR. These findings underscore the strong preference for hospital-supervised CR programs and the therapists' recognition of the importance of a holistic approach.

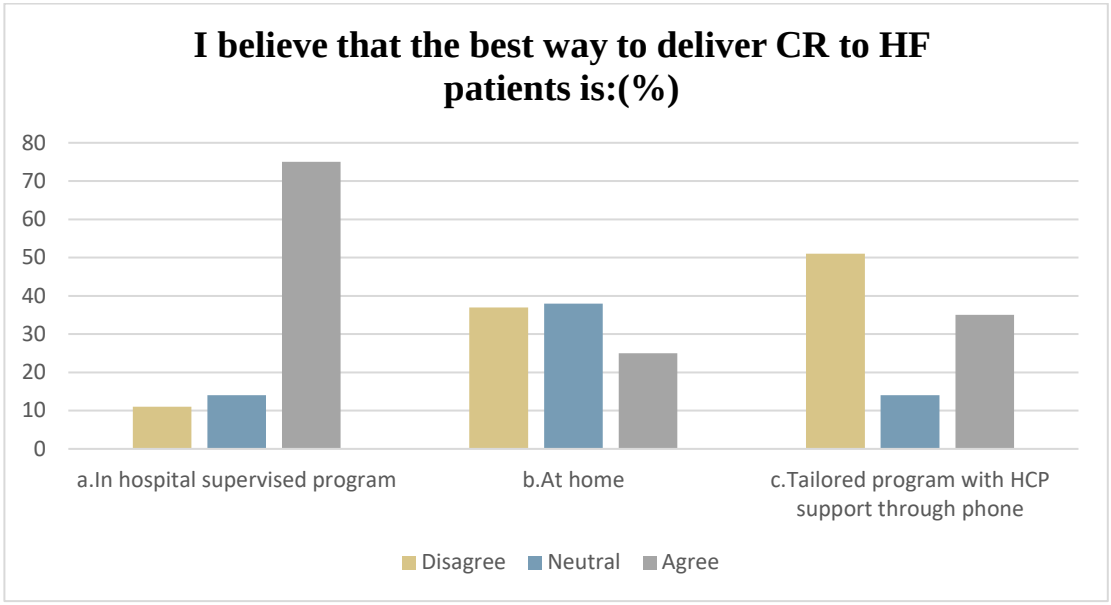

Fig. 1.1, Mode of Delivery for delivering cardiac rehabilitation

Abbreviations: HF, heart failure; CR, cardiopulmonary rehabilitation; HCP, healthcare provider.

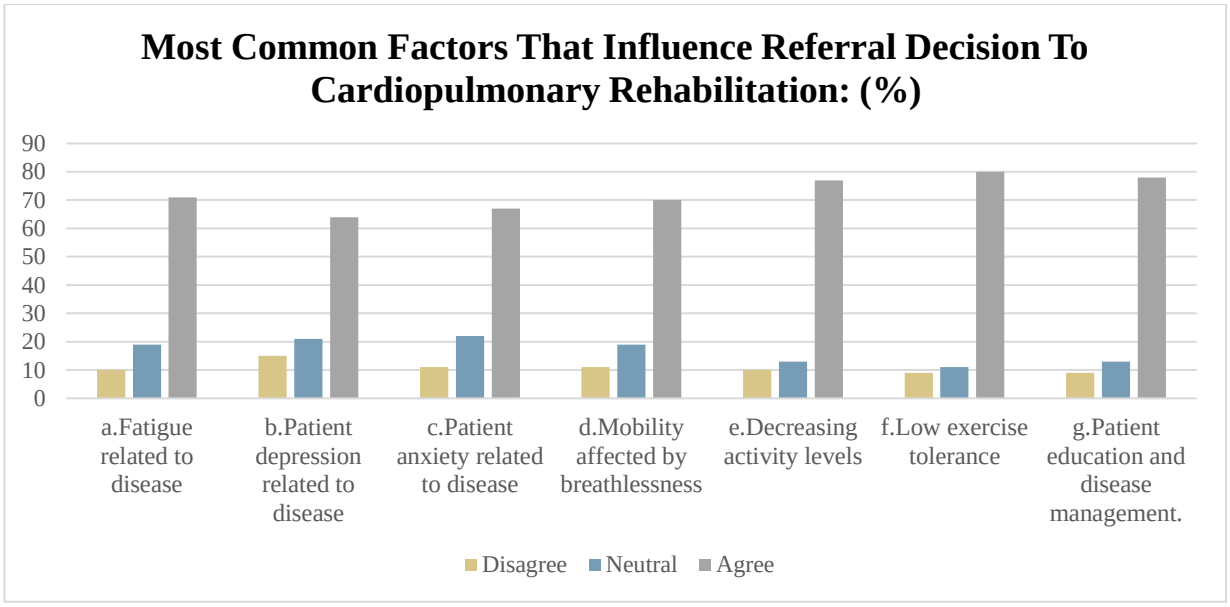

Fig. 1.3 *Patient related factors that influence referral decision to cardiopulmonary rehabilitation, using Disagree , Agree and Neutral as a grading tool*

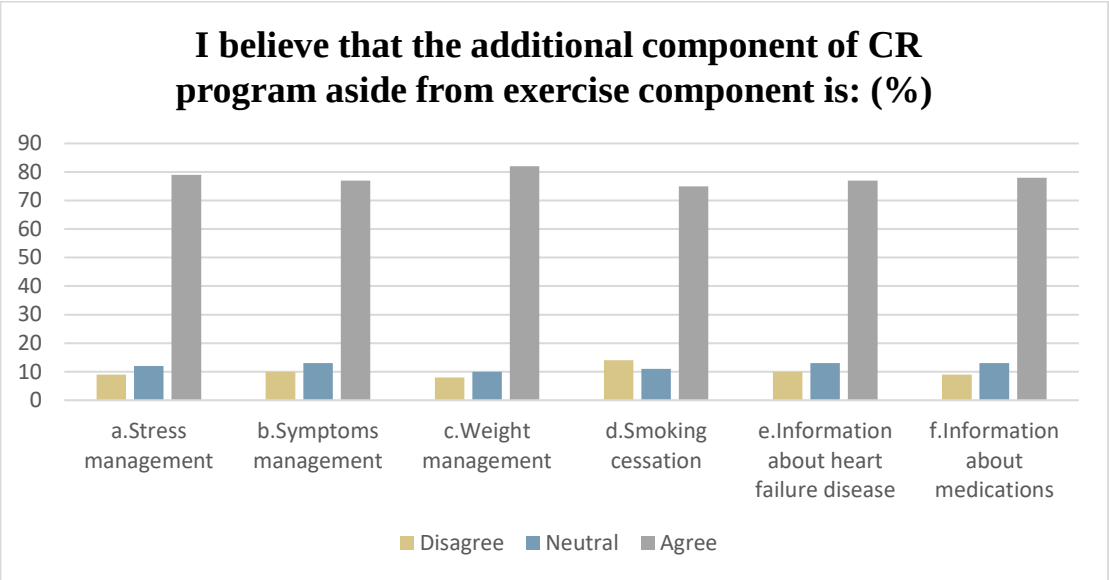

Fig. 1.4 Component of cardiac rehabilitation
Abbreviations: CR, cardiopulmonary rehabilitation.

3.3 Patient Related Factors That Influence Referral Decisions to CR

According to physical therapists (PTs) the primary factors that significantly influenced referral decision of heart failure patients to cardiac rehabilitation (CR) were Low exercise tolerance, which was cited by (80%) of PTs. Following closely, Patient education and disease management (78%), decreasing activity levels (77%), fatigue (71%) and mobility affected by breathlessness (70%), were also substantial influences, respectively according to their impact.

3.4 CR Referral Barriers

The most common barriers, according to (73%) PTs, are lack of existing standardized referring protocol, patient refusal to referral and Patients doubts that CR is worthwhile. Other significant barriers identified are limited availability of CR centers (71%), a shortage of experienced staff capable of managing HF patients (71%), High cost of treatment (68%), unavailability of transport (68%), poor mobility (67%) and timing of sessions not convenient to patients (56%).

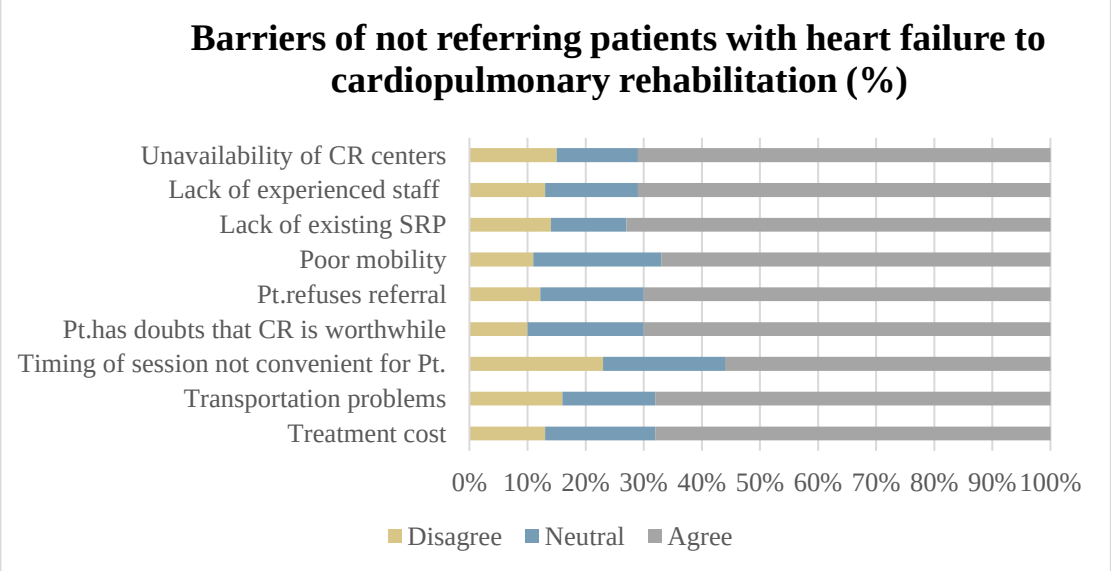

Fig.1.2 Physiotherapist perception regarding Barriers of not referring patients with Heart Failure to cardiopulmonary rehabilitation.

Abbreviations: CR, cardiopulmonary rehabilitation. ; Pt. Patient

3.5 Physiotherapist Perception Regarding Barriers of Not Referring Patients with Heart Failure to Cardiopulmonary Rehabilitation in Association To type of Setup They Work In

Out of 200 physiotherapists 36% of them who were working in private setup agreed that patient refusal to referral is the major barrier and unavailability of CR centers is the second major barrier as shown in (Figure 1.6)

Additionally, 34% physiotherapist working in public setup believed the most common barriers are patients having doubts that CR is worthwhile, lack of existing standardized referring protocols and experienced staff. Physiotherapist working in public private partnership agreed on many barriers with the same percentage as shown in (Figure 1.6). But they disagreed on the timing of session convenient for patient.

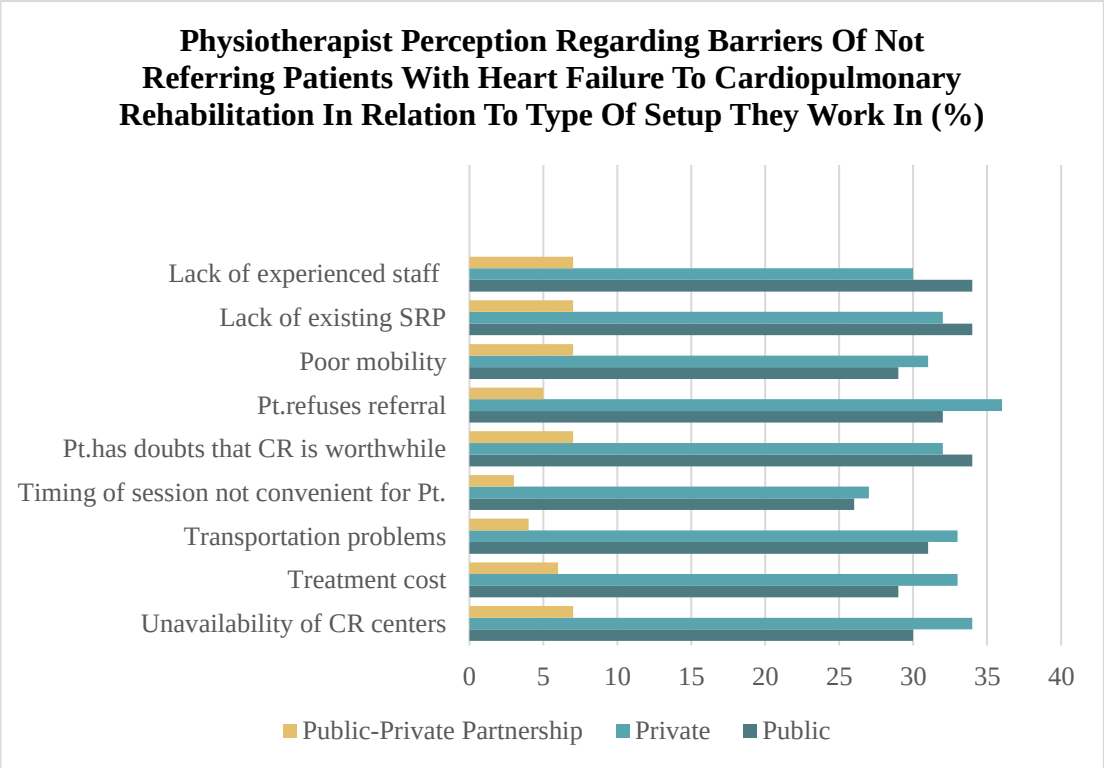

Fig.1.3 Physiotherapist perception regarding barriers of not referring patients with heart failure to cardiopulmonary rehabilitation in relation to type of setup theywork in

Abbreviations: CR, cardiopulmonary rehabilitation. ; Pt. Patient :SRP, standardized referring protocol.

3.6 Physiotherapist Perception Regarding Barriers of Not Referring Patients with Heart Failure to Cardiopulmonary Rehabilitation in Relation to Years of Experience

Most of the physiotherapist (24%) who had 1 to 2 years of experience agreed on two barriers; lack of existing standardized protocol and Patient has doubts that CR is worthwhile. Moreover, 19% Physiotherapist having experience less than 1 year believed that patient refuses referral is the barrier as shown in (Figure 1.7).

18% physiotherapist having experience of 3-4 years agreed on patient's Refusal to referral and lack of experienced staff who can manage patient.

18% physiotherapist having more than 5 yrs. of experience agreed on unavailability of CR centers as shown in (Figure 1.7)

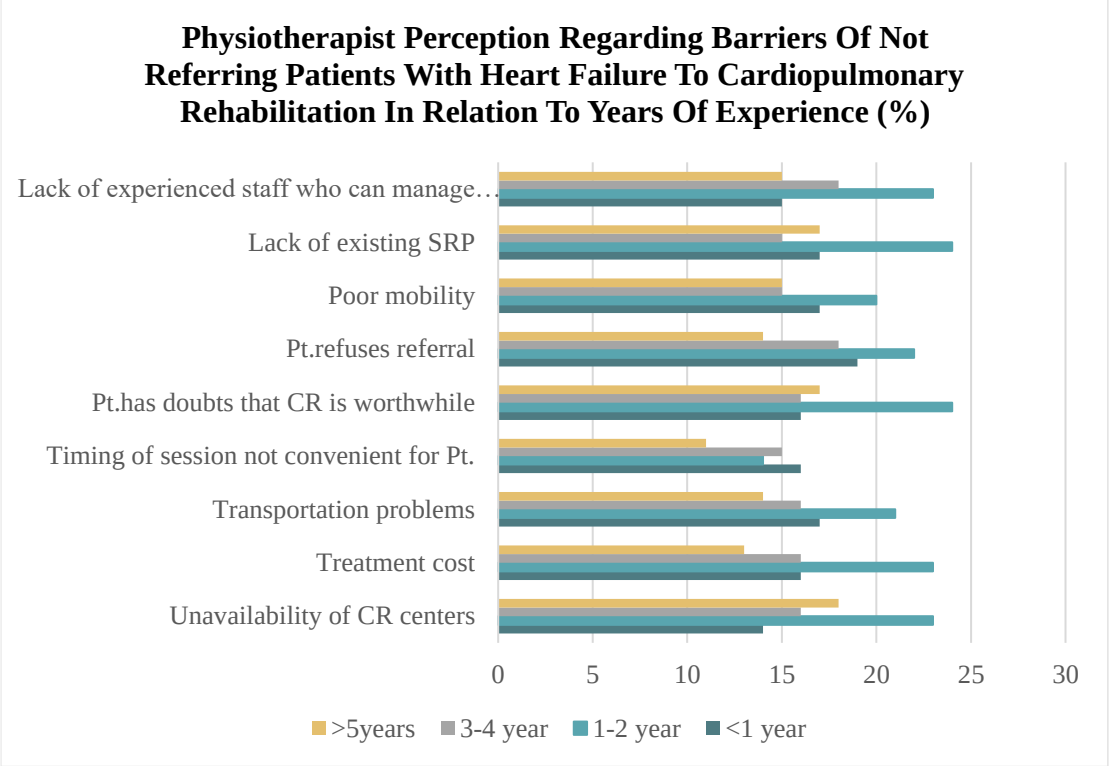

Figure 1.4 Physiotherapist Perception Regarding Barriers of Not Referring Patients with Heart Failure to Cardiopulmonary Rehabilitation in Relation to Years of Experience.

Abbreviations: CR, cardiopulmonary rehabilitation.; Pt. Patient ; SRP, standardized referring protocol.

3.7 Positive Impact of Cardiac Rehabilitation According to Physiotherapist in Relation to Their Designation

Most (32%) senior PT agreed that there is a positive impact of CR and it is worthwhile while most 44% PT graduates also believed the same. (Figure 1.8)

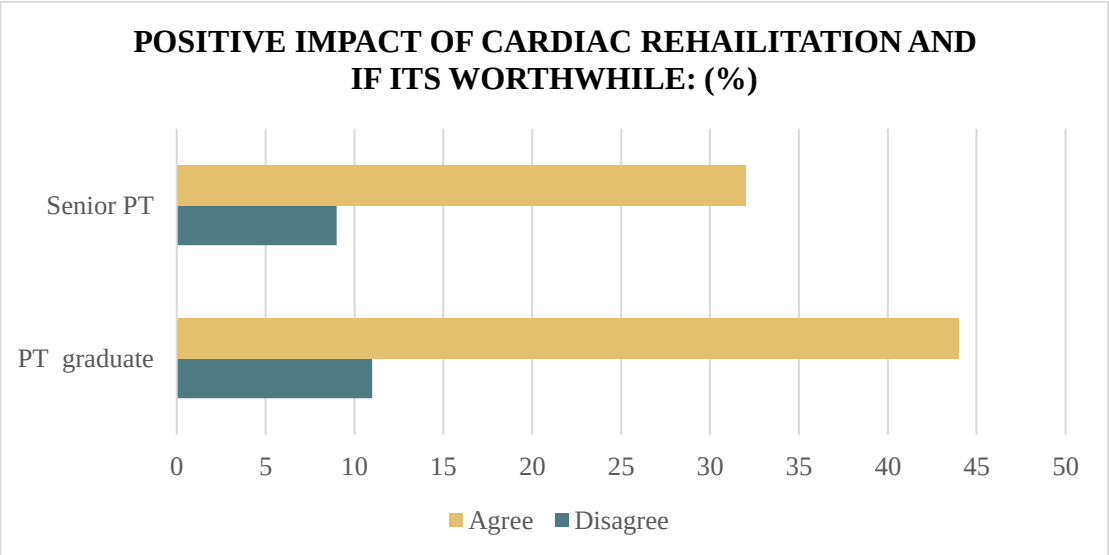

Figure 1.5 Positive Impact of Cardiac Rehabilitation According to Physiotherapist in Relation to Their Designation.

Abbreviations: CR, cardiopulmonary rehabilitation. ; Pt. Patient

4. DISCUSSION

To the best of our understanding, this is the first survey across the country that provides insight into PTs perceptions of the advantages of CR programs, their key elements, and their preferred delivery mode. We also looked into the obstacles in the referral of patients with HF to CR programs in Pakistan as well as the factors influencing these referrals. Most participants in this national survey believed that CR is an efficient program for increasing physical activity, addressing disease-related symptoms, and lowering hospital readmissions for HF patients.

Cardiac Rehabilitation Program (CRP) is an essential non-pharmacologic treatment plan for HF patients.[1] Engaging in CR programs is proven to significantly enhance the quality of life, functional capacity, exercise performance, and reduce hospitalizations among HF patients, attributed to improvements in cardiorespiratory fitness. [7]

The belief that cardiopulmonary rehabilitation benefits patients with heart failure was also more prevalent among physiotherapists with more practical experience treating HF patients. Our results are consistent with prior studies that found that the amount of clinical experience a healthcare practitioner has, can influence how well informed they are regarding the advantages of CR programs.[1]

Physiotherapists concurred that the ideal approach to offer the program to these patients is under hospital supervision. This may be due to the fact that patients with HF require extra surveillance and close supervision from the medical staff in order to avoid any potential cardiac related complications during CR. Most PTs suggested that in addition to physical exercise, the program should include patient education on how to manage their disease-related symptoms and stress. This is in line with the most recent clinical recommendations for the key elements of Cardiac Rehabilitation from the American College of Cardiology (ACC), American Heart Association (AHA), Heart Failure Society of America (HFSA), and British Association for Cardiovascular Prevention and Rehabilitation (BACPR). [17,18]

Furthermore, this literature reports the primary factors that significantly influenced the referral decision of heart failure patients to cardiac rehabilitation (CR) are Low exercise tolerance, Patient education, and disease management. Decreasing activity levels, tiredness, difficulties moving due to shortness of breath, and anxiety-depression linked to disease are additional factors in line. In this study, the most common barriers according to PTs, are the lack of existing standardized referring protocol and Patients refusal to refer. Patients also have doubts that CR is worthwhile due to a lack of awareness. The unavailability of Cardiac Rehab centers in Pakistan is also one of the biggest obstacles to referring heart failure patients to Cardiac Rehabilitation in Pakistan. According to the literature, in Pakistan, there are only a limited number of facilities providing Cardiac Rehabilitation programs for individuals with heart failure. and can only fit a small number of patients with cardiac issues. Also, Patients in Pakistan frequently struggle financially, preventing them from enrolling in rehabilitation programs that could be expensive.

In this study, it was found that one of the most significant challenges in the referral process is the shortage of skilled and experienced professionals capable of handling patients with heart failure. Considering physiotherapy professionals, effective cardiac rehabilitation is significantly hampered by the scarcity of qualified physiotherapists capable of overseeing patients with heart failure. Inadequate availability of trained physiotherapists can lead to delayed or suboptimal care for heart failure patients, limiting the quality and accessibility of rehabilitation services.

Improving patient education is crucial for physiotherapists working with heart failure patients. They should prioritize educating HF patients about the significant advantages of cardiac rehabilitation (CR) programs. It's essential to highlight how CR can positively impact physical fitness, reduce breathlessness, and enhance overall well-being to motivate patients to opt for CR. The strong preference for hospital-based CR programs among physiotherapists underscores the importance of health care institutions establishing and promoting such programs. Effective hospital-based CR programs require collaboration between physiotherapists, cardiologists, and hospital management. To address barriers like the absence of standardized referral protocols and patient skepticism about

CRs value, healthcare systems should establish clear and standardized procedures for referring HF patients to CR.

This survey has a unique geographical focus on Pakistan. While the other studies provide valuable insights on other geographical areas, this research can offer a perspective tailored to the Pakistani healthcare system, which may have its own set of challenges and opportunities regarding cardiac rehabilitation. In contrast, the referenced studies provide valuable insights into patient engagement in other heart diseases that delves into a separate facet of cardiac rehabilitation, focusing on a different group of individuals. [14,16,19] Since; Physiotherapists are the focus of this study, which offers a distinctive viewpoint that hasn't been thoroughly investigated in the context of cardiac rehabilitation. By investigating the barriers faced by physiotherapists comprehensively, this study can contribute to a more holistic understanding of the cardiac rehabilitation landscape in Pakistan. It can help in addressing both patient related and provider related issues for better outcomes. This literature may also point to areas where cardiologists, physiotherapists, and other healthcare professionals might work together collaboratively to give optimal HF care. This cooperation may result in rehabilitation programs that are more thorough and successful. [11, 16,19]

Overall, this survey has the advantage of addressing a specific geographical context and physiotherapists perspective, which can complement the insights provided by the other studies and potentially lead to more tailored and effective solutions for cardiac rehabilitation among heart failure patients in Pakistan and might result in recommendations for new policies and actions to improve the standard of care.

Limitations

The study has certain limitations. Convenience sampling introduces selection bias, while self-reported questionnaire data may suffer from response bias. A small sample size and low response rate may affect representativeness. Findings may not apply universally due to differing healthcare systems and cultural norms. Lack of qualitative interviews hampers understanding.

Recommendations

Studies on interventions to overcome identified barriers or the impact of improved cardiac rehabilitation on patient outcomes can be done. Utilizing mixed method studies combining quantitative questionnaires with qualitative interviews can provide deeper insights. Employing randomized sampling methods will enhance study validity and broaden generalizability.

CONCLUSION

Physiotherapists face challenges while offering cardiac rehabilitation to individuals suffering from heart failure. The majority of them agreed that cardiac rehabilitation improved patients' physical fitness and ability to do ADLs, and that the best approach to provide it is through a hospital supervised program. In addition to exercise, weight control is a component of cardiac rehabilitation. The most common factor impacting referral choices to cardiac rehabilitation is a lack of exercise tolerance. Furthermore, the key focus, which are the barriers, the majority of physiotherapists agreed on three key barriers: patients doubts regarding the benefit of Cr, patients' unwillingness to be referred, and a lack of consistent referring practice. Focusing on many of these challenges can ultimately lead to a shift in these perceptions, which might enhance the quality of life for those with heart failure.

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REFERENCES

1. Aldhahir AM, Alhotye M, Alqahtani JS, et al. Physicians' Perceptions of and Barriers to Cardiopulmonary Rehabilitation for Heart Failure Patients in Saudi Arabia: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*. 2022 Jan;19(22):15208.
2. Sérvio, Thaianne, Cavalcante, et al. Barriers to cardiac rehabilitation delivery in a low-resource setting from the perspective of healthcare administrators, rehabilitation providers, and cardiac patients. *BMC health services research vol*. 19,1 615. 2 Sep. 2019, doi:10.1186/s12913-019-4463-9
3. Jain V, Minhas AMK, Morris AA, et al. Demographic and Regional Trends of Heart Failure-Related Mortality in Young Adults in the US, 1999-2019. *JAMA Cardiology vol.* 7,9 (2022): 900-904. doi:10.1001/jamacardio.2022.2213
4. Savarese G, Lund LH. Global public health burden of heart failure. *Cardiac failure review*. 2017 Apr;3(1):7.
5. NHS Conditions - Heart Failure. [Internet]. *National Health Service (NHS).* Available from: https://www.nhs.uk/conditions/heart-failure (accessed on 02/08/2023)
6. Ujala M, Azam N, Khattak TH, Mashhadi SF, Kamran J, Malik AA. Role of Cardiac Rehabilitation in Improving Health Status & Quality of Life of Heart Failure Patients-A Randomized Controlled Trial. *Pakistan Armed Forces Medical Journal.* 2022 Feb 25;72(SUPPL-1):S16-20.
7. Bozkurt B, Fonarow GC, Goldberg LR, et al. Cardiac rehabilitation for patients with heart failure: JACC expert panel. *Journal of the American College of Cardiology*. 2021 Mar 23;77(11):1454-69.
8. Chun KH, Kang SM. Cardiac Rehabilitation in Heart Failure. *International Journal of Heart Failure*. 2021 Jan;3(1):1-4.
9. Passantino A, Dalla Vecchia LA, Corrà U, et al. The Future of Exercise-Based Cardiac Rehabilitation for Patients with Heart Failure. *Front Cardiovasc Med.* 2021 Aug 4; 8:709898. doi: 10.3389/fcvm.2021.709898. PMID: 34422933; PMCID: PMC8371325.
10. A CebrickGrossman J. Cardiac disease, cardiac rehabilitation and barriers to participation - *an overview. Nursing and Palliative Care*. 2016;1(1):13–7.
11. Amirova A, Lucas R, Cowie MR, Haddad M. Perceived barriers and enablers influencing physical activity in heart failure: A qualitative one-to-one interview study. *PloS one.* 2022 Aug 4;17(8):e0271743.
12. Kikuchi A, Taniguchi T, Nakamoto K, et al. Feasibility of home-based cardiac rehabilitation using an integrated telerehabilitation platform in elderly patients with heart failure: A pilot study. *J Jpn Coll Cardiol*. 2021 Jul;78(1):66-71. doi: 10.1016/j.jjcc.2021.01.010.
13. Rengo JL, Savage PD, Barrett T, Ades PA. Cardiac Rehabilitation Participation Rates and Outcomes for Patients with Heart Failure. *J Cardiopulm Rehab Prev.* 2018;38(1):38-42. doi: 10.1097/HCR.0000000000000252.
14. Nuhu JM, Gachi LS. A qualitative study on barriers to practitioner implementation of cardiac rehabilitation services in a tertiary health facility in Kano, Nigeria. *Journal of the Nigeria Society of Physiotherapy*. 2021 Jul 31;20(1):8-15.
15. Pulignano G, Tinti MD, Del Sindaco D, et al. Barriers to cardiac rehabilitation access of older heart failure patients and strategies for better implementation. *Monaldi Archives for Chest Disease*. 2015;84(1-2).

16. Dunlay SM, Witt BJ, Allison TG, et al. Barriers to participation in cardiac rehabilitation. *American Heart Journal*. 2009 Nov 1;158(5):852-9.
17. Yancy CW, Jessup M, Bozkurt B, et al. 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. *Journal of the American College of Cardiology vol.* 70,6 (2017): 776-803. doi:10.1016/j.jacc.2017.04.025
18. Cowie A, Buckley J, Doherty P, et al. Standards and core components for cardiovascular disease prevention and rehabilitation. *Heart (British Cardiac Society) vol.* 105,7 (2019): 510-515. doi:10.1136/heartjnl-2018-314206
19. Grossman JA. Cardiac disease, cardiac rehabilitation and barriers to participation-an overview.
20. Khushhal A, Alsubaiei M. Barriers to Establishing Outpatient Cardiac Rehabilitation in the Western Region of Saudi Arabia: A Cross-Sectional Study. J Multidiscip Healthc. 2023 Mar 9;16:653-661. doi:10.2147/JMDH.S398687.