Original article

Peripheral muscle strength, mobility and quality of life in hospitalized patients with cardiovascular deficiencies: a cross-sectional study

Força muscular periférica, mobilidade e qualidade de vida em pacientes hospitalizados por deficiências cardiovasculares: estudo transversal

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ABSTRACT | INTRODUCTION: Cardiovascular disabilities (CVDs) consist of alterations in cardiovascular function and other organs and systems. **OBJECTIVE:** Assess and compare peripheral muscle strength, mobility, and quality of life in hospitalized patients with CVDs. **METHODS:** Cross-sectional and prospective study, convenience sample, in a university hospital, convenience sample of patients of both sexes aged 18 years or older. The Medical Research Council (MRC) and Functional Status Score for the ICU (FSS-ICU) scores and the Minnesota Living with Heart Failure Questionnaire (MLHFQ) were evaluated. Categorical variables were described by frequencies. Quantitative variables were described in terms of central tendency and dispersion. The Kolmogorov-Smirnov test was used to test for normal distribution. Comparison between variables was performed using Student's t-test or Mann-Whitney test and ANOVA or Kruskal-Wallis test. Significance level $p<0.05$. Analyses were performed using Jamovi software. **RESULTS:** 102 patients, MRC 58 (48-60), FSS-ICU 34 (29-35), QV - MLHFQ 49.1±21.4. MRC showed a significant difference between the sexes for women ($p=0.004$) and MLHFQ showed poor quality of life in 61 patients with 59.80%. The MRC score was higher among men ($p=0.004$). Mobility was preserved in patients with fewer comorbidities ($p=0.040$). **DISCUSSION:** Muscle mass characteristic of the diagnosis of CKD does not necessarily determine the presence of muscle weakness. Mobility may be associated with peripheral muscle strength. QoL is impacted by the presence of dyspnea, fatigue, and edema characteristics of CVD. **CONCLUSION:** Patients had preserved MRC and FSS and reduced QoL, with lower muscle strength scores in women and lower mobility in patients with three or more comorbidities.

KEYWORDS: Physiotherapy Modalities. Musculoskeletal System. Muscle Strength. Quality of Life.

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RESUMO | INTRODUÇÃO: As deficiências cardiovasculares (DCVs) consistem em alterações da função cardiovascular e de outros órgãos e sistemas. **OBJETIVO:** Avaliar e comparar a força muscular periférica, a mobilidade e a qualidade de vida de pacientes hospitalizados com DCVs. **MÉTODOS:** Trata-se de um estudo transversal e prospectivo, realizado com amostra de conveniência, em hospital universitário, com pacientes de ambos os sexos, idade igual ou superior a 18 anos. Foram avaliados os escores *Medical Research Council* (MRC) e *Functional Status Score for the ICU* (FSS-ICU), e aplicado o questionário *Minnesota Living with Heart Failure Questionnaire* (MLHFQ). Variáveis categóricas foram descritas com frequências, e variáveis quantitativas com medidas de tendência central e dispersão. A distribuição de normalidade foi obtida pelo teste Kolmogorov-Smirnov. A comparação entre as variáveis foi realizada com os testes T de Student ou Mann-Whitney e Anova ou Kruskal-Wallis. Adotou-se nível de significância de p<0,05. Análises foram realizadas no *software* Jamovi. **RESULTADOS:** Em 102 pacientes, o MRC foi 58 (48-60), o FSS-ICU, 34 (29-35) e o QV MLHFQ, 49,1±21,4. O MRC apresentou diferença significante entre os sexos para mulheres (p=0,004), e o MLHFQ apresentou qualidade de vida ruim em 61 pacientes, com 59,80%. O MRC obteve pontuação maior entre os homens (p=0,004). A mobilidade foi preservada nos pacientes com menos comorbidades (p=0,040). **DISCUSSÃO:** A massa muscular característica do diagnóstico de DCV não determina a presença de fraqueza muscular. A mobilidade pode estar associada à força muscular periférica. A QV é impactada pela presença de dispneia, fadiga e edema característico da DCV. **CONCLUSÃO:** Pacientes apresentaram MRC e FSS preservados e QV reduzida, com menores escores de força muscular nas mulheres e houve menor mobilidade em pacientes com três ou mais comorbidades.

PALAVRAS-CHAVE: Modalidades de Fisioterapia. Músculo Esquelético. Força Muscular. Qualidade de Vida.

1. Introduction

Cardiovascular disabilities (CVDs) are among the leading causes of hospitalization and can compromise muscle function, mobility, and quality of life in patients. They consist of a set of conditions that alter cardiovascular function, affecting other organs and systems, and stand out as one of the leading causes of morbidity and mortality worldwide[1,2]. Annually, these impairments are responsible for approximately 17 million deaths worldwide, which corresponds to several years of life lost or lived with limitations and restrictions[1,3].

According to projections, this number will increase worldwide in the coming years[4]. In Brazil, CVDs are the leading cause of mortality, which can be explained mainly by population growth and progressive aging[5]. Thus, researching the impact of CVDs on functionality provides better therapeutic planning and decision-making regarding hospital discharge and post-discharge care.

CVDs are related to the loss of functional capacity caused by decreased oxidative capacity and blood perfusion in skeletal muscle[6]. These muscle deficiencies are progressive and associated with atrophy, resulting in reduced muscle power and strength. In addition, they are also related to the early onset of dyspnea, edema, and muscle fatigue, which compromises the performance of activities of daily living (ADLs)[7].

Among the activities that may be affected is mobility, since CVDs can predispose individuals to musculoskeletal changes that impact organ structure and function[8]. Studies show that signs and symptoms of CVD, associated with the prolonged course and complexity of functional impairment, also influence the social, psychological, and spiritual aspects of individuals, negatively affecting their quality of life (QoL)[9].

In Brazil, patients with CVDs receive follow-up care in primary care settings. However, these patients are referred to hospitals[10] in acute situations, when there are risks of immobility and its deleterious effects, which can impact patients' abilities, from hospitalization to discharge.

In this context, analyzing parameters related to muscle strength, mobility, and QoL can provide essential information for physical therapists, allowing them to improve assessment and early diagnosis and prevent complications during hospitalization, contributing to the adoption of more effective therapeutic measures tailored to the needs of these patients.

Thus, the present study aimed to evaluate and compare peripheral muscle strength, mobility, and quality of life in hospitalized patients with CVDs.

2. Methods and materials

This is a cross-sectional, prospective study that is part of a larger project approved by the Ethics and Research Committee under opinion number 6531187. All participants signed an informed consent form, agreeing to participate in the study.

This study was written in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology – STROBE[11] criteria. A convenience sample was defined based on a sample calculation performed using the SurveyMonkey calculator. It consisted of 66 patients, considering a population of 200 patients admitted during the period who met the inclusion criteria for the study, with a confidence level of 95% and a margin of error of 10%. The study was conducted between January and November 2022 in the cardiology department of a federal university hospital.

Patients aged 18 years or older, of both sexes, admitted to the cardiology ward and physical therapy service were included. Participants with cardiac decompensation, limited mobility due to musculoskeletal impairments, difficulty understanding, as assessed and recorded in the medical record, and who were unable to answer the questionnaire and perform the assessment tests were excluded, as well as patients with incomplete data in the medical record.

Sociodemographic and clinical characteristics were collected from medical records and organized into a form prepared by the researchers, which recorded data on name, age, sex, date of admission, clinical diagnosis, physiotherapeutic diagnosis, and profile (clinical or surgical). The Medical Research Council (MRC) score tests—primary outcome and Functional Status Score for the ICU (FSS-ICU)—were performed, and the Minnesota Living with Heart Failure Questionnaire was administered. Data collection took place during the period of hospital admission until the fifth day of hospitalization.

Peripheral muscle strength was assessed using the MRC scale, a simple instrument adapted to measure this parameter. This score assesses six movements of the upper and lower limbs. The score ranges from 0 to 60 points, with a score < 48 indicating muscle weakness, which is associated with negative outcomes[12].

Mobility was also assessed using the FSS-ICU. This score aims to verify physical function and is widely used in nursing environments. It has been validated internationally and has been translated and cross-culturally adapted into Brazilian Portuguese[13]. This scale includes five functional tasks: rolling over, transferring from a supine to a sitting position, from a sitting to a standing position, sitting on the edge of the bed, and walking. The total score ranges from 0 to 35, with higher values indicating greater mobility and greater independence for transfers and locomotion[14].

To classify the values obtained, the International Classification of Functioning, Disability, and Health (ICF) was used, considering as no limitations cases in which the score was between 96% and 100% of the total, as mild limitation, those with scores between 50% and 95%, as moderate limitation, those with values between 25% and 49%, as severe limitation between 5% and 24%, and total limitation between 0 and 4%[15].

Quality of life was assessed using the Minnesota Living with Heart Failure Questionnaire (MLHFQ), validated in Brazil[16], which aims to quantify and qualify the quality of life of patients with heart failure (HF) based on the individual's perception of the physical, psychological, and socioeconomic effects of the disease. In addition, the MLHFQ has been the questionnaire of choice for assessing QoL in the CVD population in general, since HF is the end result of most cardiovascular diseases[17].

In total, participants answered 21 items using a six-point Likert scale (0 to 5), with a score of zero referring to the descriptor “no limitation” and a score of five corresponding to “maximum limitation.” The total score summary can range from 0 to 105, with lower scores reflecting better QoL. For the classification of this variable, scores below 24 were considered good quality of life, between 24 and 45 moderate quality of life, and above 45 poor quality of life[18]. The instrument was applied at the time of the subject's admission to the study, with an average application time of 15 minutes, by a single, previously trained researcher and without interference from family members.

A comparison was made between the scores obtained for peripheral muscle strength, mobility, and quality of life, according to gender, age group, and number of comorbidities, in order to verify the existence of differences between the groups.

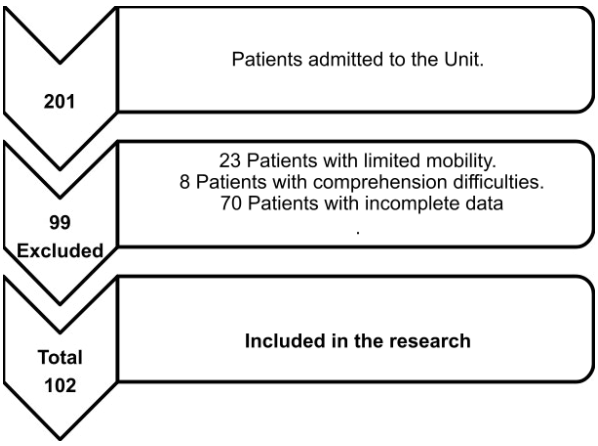
To avoid bias, the research was conducted using a representative sample, valid and reliable data collection instruments, and appropriate statistical analysis techniques.

Categorical variables were described using absolute and relative frequencies. For quantitative variables, measures of central tendency and dispersion were used. The normal distribution of the variables of interest was verified using the Kolmogorov-Smirnov test. For the comparison analysis between the MRC, FSS-ICU, and MLHFQ variables (dependent variables) with the grouping variables (gender, age group, and comorbidities), Student's t-test or Mann-Whitney test (2 categories) and one-way ANOVA or Kruskal-Wallis test (3 or more categories) were applied. For variables whose Kruskal-Wallis value was significant ($p<0.05$), the Dwass-Steel-Critchlow-Fligner test was used for multiple comparison analysis. The level of significance adopted was $p<0.05$. All analyses were performed using Jamovi software, version 2.3. For the analysis of the results, the age group was divided into young adults aged 18-39, middle-aged adults aged 40-59, and elderly adults aged over 60.

3. Results

A total of 201 patients admitted between January and October 2022 were included. However, 99 were excluded according to the exclusion criteria. Thus, the study included 102 patients (Figure 1).

Figure 1. Flow diagram of participant inclusion in the study



Source: the authors (2025).

The sample consisted of individuals aged between 18 and 88 years. Different comorbidities were identified in the sample, such as systemic arterial hypertension (SAH), diabetes mellitus (DM), obesity, and dyslipidemia, with SAH (52.94%) and DM (29.41%) being the most frequent. The other sociodemographic and clinical characteristics are presented in Table 1.

Table 1. Sociodemographic and clinical characteristics of patients (n=102)

Characteristics	Values
Age in years – mean (SD)	60.1 (15.1)
Sex (%)	
Male	53 (51.7)
Female	49 (48.0)
Age range n (%)	
18 to 39 years"	9 (9.8)
40 to 59 years	38 (37.2)
60 years or more	55 (53.9)
hospitalization profile n (%)	
Clinical	30 (29.4)
Surgical	72 (70.6)
Reasons for hospitalization n (%)	
Decompensated heart failure	29 (28.4)
Acute myocardial infarction	26 (25.5)
Coronary artery disease	12 (11.8)
Unstable angina	7 (6.9)
Bacterial endocarditis	5 (4.9)
Atrioventricular block	4 (3.9)
Valvular heart disease	4 (3.9)
Others	15 (14.7)
Comorbidities n (%)	
Absent	7 (6.7)
One comorbidity	20 (19.6)
Two comorbidities	25 (24.5)
Three or more	50 (49.0)

Source: the authors (2025).

The analysis of peripheral muscle strength, mobility, and quality of life using qualifiers from the Brazilian Classification of Physiotherapy Diagnosis (BCPD) is shown in Table 2.

Table 2. Characteristics of peripheral muscle strength, mobility, and quality of life of patients (n=102)

Outcome	Categories	N (%)
Medical Research Council	Muscle strength preserved	72 (70.58)
	Muscle weakness	30 (29.41)
Functional Status Score for the ICU	No limitation	52 (50.98)
	Mild limitation	43 (42.15)
	Moderate limitation	6 (5.88)
	Severe limitation	1 (0.98)
	Total limitation	0 (0)
Minnesota Living with Heart Failure Questionnaire	Good quality of life	12 (11.76)
	Moderate quality of life	29 (28.43)
	Poor quality of life	61 (59.80)

Source: the authors (2025).

Table 3 shows differences between gender, age, and comorbidity in the study sample in relation to MRC.

Table 3. Comparative analysis between peripheral muscle strength assessed by the Medical Research Council and clinical variables of patients (n=102)

	Groups	Median (IQR)	p-value
Sex	Female	54 (46-60)	0.004[a]
	Male	60 (55-60)	
Age range	18 – 39 years	60 (56-60)	0.503[b]
	40 - 59 years	58.5 (48-60)	
	60 years or more	56 (48-60)	
Comorbidities	Absent	60 (52.5-60)	0.204[b]
	One	60 (53.5-60)	
	Two	56 (52-60)	
	Three or more	56 (48-60)	

Source: the authors (2025).
Note: [a]Mann-Whitney; [b]Kruskal-Wallis, followed by the Dwass-Steel-Critchlow-Fligner test.

Table 4 shows the results of the comparative analysis between the scores obtained by individuals on the FSS-ICU and clinical variables.

Table 4. Comparative analysis between mobility assessed by the Functional Status Score for the ICU and clinical variables of patients admitted to the cardiology ward of a university hospital (n = 102)

	Groups	Median (IQR)	p-value
Sex	Female	31 (29-35)	0.318[a]
	Male	34 (29-35)	
Age range	18 - 39 years	35 (32-35)	0.252[b]
	40 -59 years	34 (26.5-35)	
	60 years or more	32 (29-35)	
Comorbidities	Absent	34 (25.5-35)	0.040[b]
	One	35 (33.8-35)	
	Two	34 (31-35)	
	Three or more	31 (25-35)	

Source: the authors (2025).
Note: [a]Mann-Whitney; [b]Kruskal-Wallis, followed by the Dwass-Steel-Critchlow-Fligner test.

Table 5 shows the comparison between individuals' MLHFQ scores and clinical variables.

Table 5. Comparative analysis between quality of life assessed by the Minnesota Living with Heart Failure Questionnaire and clinical variables of patients admitted to the cardiology ward of a university hospital (n=102)

	Groups	Median (IQR)	p-value
Sex	Female	51.2 (21.6)	0.333[a]
	Male	4.1 (21.3)	
Age range	18 - 39 years	52 (27.8)	0.650[b]
	40 - 59 years	51.1 (21.6)	
	60 years or more	47.2 (20.3)	0.982[b]
Comorbidities	Absent	47.7 (23.3)	
	One	47.5 (22.4)	
	Two	49.7(18.2)	
	Three or more	49.6(22.8)	

Source: the authors (2025).
Note: [a]Student's t-test; [b]One-way ANOVA.

4. Discussion

In the present study, the kinetic-functional diagnosis revealed peripheral muscle weakness 58 (48-60), mild mobility limitation 34 (29-35), and a reduction in average quality of life of 49.1±21.4. Females had worse MRC, and mobility was better in patients with fewer comorbidities.

As for the MRC, the median obtained by the individuals was 58 (48-60). Regarding peripheral muscle strength, it is known that CVDs are related to muscle mass loss[19,20]. This is due, among other factors, to an imbalance between anabolic and catabolic processes, with consequent muscle degradation. This imbalance results from increased levels of pro-inflammatory cytokines, such as interleukin-6 (IL-6) and tumor necrosis factor-α (TNF-α), which activate the ubiquitin-proteasome pathway, culminating in protein degradation[21,22].

Regarding individuals with muscle weakness, in a study conducted on people with heart failure who were monitored on an outpatient basis, 19.5% of participants presented muscle loss, which was associated with decreased strength[23]. Despite this, MRC scores indicated preserved muscle strength in 70% of individuals, which is consistent with other studies that evaluated this parameter in patients with CVD admitted to the hospital setting[24,25]. This can be explained because, despite the characteristic loss of muscle mass, a diagnosis of CMD does not necessarily determine the presence of weakness, which is also associated with other factors, such as the severity of this deficiency[20].

Regarding the results obtained from the FSS-ICU, the median was 34 (29-35), close to the maximum score, indicating preserved mobility. There are few publications on the population with CVD that have analyzed this variable in the hospital setting. In a study that analyzed the mobility of hospitalized patients with CVDs using the Intensive Mobility Scale (IMS), a score equivalent to the presence of mild limitation at admission was observed, which corroborates the present study[24].

Mobility limitation consists of a partial or total reduction in the ability to perform certain activities, such as transfers and locomotion[26]. Assessing these limitations in patients with CVDs is important because, based on this analysis, it is possible to identify those who are at greater risk of decline and, consequently, have greater demands related to physical therapy. Therefore, patient mobility is important and should not be neglected during hospitalization[27,28].

Studies show that mobility is associated with peripheral muscle strength[13,29]. Thus, individuals who have strength deficits resulting from the catabolic mechanism characteristic of CVDs may have mobility limitations. This relationship may explain the findings of the present study, since the participants had preserved strength, with consequent maintenance of the ability to perform transfers and locomotion.

Regarding the QoL instrument, the mean score of 49.1±21.4 obtained can be interpreted as a perception of poor QoL among the individuals analyzed. These scores were higher than those reported in the literature. In a study that evaluated factors related to readmission and poor quality of life among patients with HF, 42% of individuals obtained a score equivalent to good quality of life[30].

Other studies that investigated QoL in patients with HF using the MLHFQ indicated moderate quality of life[31,32]. These findings differ from those found in the present study, as the analyses cited were performed at the outpatient level, which implies less clinical complexity and physical impairment of patients. This directly impacts the scores obtained, since symptoms such as dyspnea, fatigue, and edema, which are characteristic of CVDs and often exacerbated in patients admitted to the hospital setting, directly influence QoL[32].

There was a difference between the sexes in relation to MRC, with the median obtained by women being significantly lower than that found in men. These findings corroborate studies conducted with critically ill patients, who showed a significant difference in

peripheral muscle strength when comparing both sexes, with lower values obtained by women. This difference can be explained by the physiological decrease in muscle strength in females, considering both upper and lower limbs, which is due to hormonal differences between the sexes[33,34].

Studies point to some limitations related to assessment using the MRC, such as lower reliability in identifying muscle weakness when quantifying scores between grades 4 and 5, as well as aspects that can cause confusion in interpreting the results, such as the patient's position at the time of scoring and the muscle group being assessed[35,36]. Despite these factors, the literature points to good applicability for the diagnosis of muscle weakness to be made based on the MRC in hospital units[35].

There was a significant difference according to the number of comorbidities, since individuals with three or more comorbidities had lower scores at admission when compared to those with only one associated pathology. There was no significant difference between genders and age groups in the FSS-ICU.

According to the literature, it is known that the coexistence of chronic diseases can trigger a series of changes, such as an increased risk of falls, which culminate, among other things, in physical inactivity and immobility[37], which explains the difference found between the groups.

Regarding the comparison between individuals' MLHFQ scores and clinical variables, there was no significant difference between any of the variables analyzed. This can be attributed to the fact that the concept of QoL is subjective and influenced by physical, psychological, social, economic, and spiritual dimensions, thus varying according to sociocultural conditions, personal aspirations, and the conditions in which the individual lives[38].

The analysis of the impact of CVDs on this parameter has been considered relevant because it allows for the development of treatment plans and the definition of therapeutic approaches. Furthermore, QoL is an important indicator of morbidity and mortality and is considered a public health parameter[39].

This study has some limitations, such as possible memory bias, since the quality of life instrument refers to changes that occurred in the last month in relation to the time of application. In addition, one must also consider the likelihood of response bias on the part of the patient, as the application was conducted in the form of an interview, and some questions could cause some level of inhibition, such as the item referring to sexual activity, even though the application was conducted without the interference or presence of third parties.

Another limiting factor concerns the fact that this is a cross-sectional study, which does not allow for the establishment of cause-and-effect relationships between cardiovascular deficiencies and the variables of interest analyzed. The other scores used to assess the variables of interest also have limitations. However, despite these restrictions, they are validated instruments that are easy to apply and reproduce.

Another limitation was that it was not possible to perform the six-minute walk test, which is essential for assessing functional capacity (FC) and based on this assessment, developing individualized exercise protocols. In addition, spirometry was not performed to exclude patients with mixed diseases, and respiratory muscle strength was not assessed.

It is worth noting that the study does not generalize the results obtained to other populations, contexts, and situations beyond those specific to the study.

5. Conclusion

Individuals hospitalized with CVDs showed preserved peripheral muscle strength and mobility in the overall analysis of the sample. Lower muscle strength scores were observed in women, as well as lower mobility scores among patients who had three or more comorbidities, compared to those who had only one. CVD negatively influences the perception of quality of life, as it was rated as poor among the sample analyzed. Thus, further studies on this topic are needed to investigate the factors associated with the variables of interest.

Authors' contributions

The authors declared that they have made substantial contributions to the work in terms of the conception or design of the research; the acquisition, analysis or interpretation of data for the work; and the writing or critical review for relevant intellectual content. All authors approved the final version to be published and agreed to take public responsibility for all aspects of the study.

Competing interests

No financial, legal, or political conflicts involving third parties (government, private companies, and foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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