

Protocol for physiotherapeutic management of home care for elderly patients with hip and knee osteoarthritis

Protocolo de manejo fisioterapêutico de atendimento domiciliar para o idoso com artrose de quadril e joelho

Protocolo de manejo fisioterapêutico domiciliario de personas mayores con artrosis de cadera y rodilla

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franklin.cashabamba@udla.edu.ec**ARTICLE HISTORY****Received:** 24-01-2024**Revised Version:** 11-04-2024**Accepted:** 24-04-2024**Published:** 13-05-2024**Copyright:** © 2024 by the authors**License:** CC BY-NC-ND 4.0**Manuscript type:** Article**ARTICLE INFORMATION****Science-Metrix Classification (Domain):**

Health Sciences

Main topic:

Physiotherapy for elderly osteoarthritis

Main practical implications:

The implementation of personalized exercise programs improves functional capacity, muscle strength and pain perception in elderly people with hip and knee osteoarthritis, improving their overall quality of life.

Originality/value:

The originality of this article is due to introducing a complete home physiotherapy protocol developed specifically for elderly people with hip and knee osteoarthritis, demonstrating significant improvements in functional capacity and pain control.

ABSTRACT

Background: Lower body musculoskeletal disorders are problems that affect muscles, bones, joints, tendons, ligaments, and nerves of the lower limbs. Osteoarthritis of the hip and knee is a degenerative disease that affects the cartilage of the hip and knee joints. It causes pain, stiffness and limited movement. **Objective:** to implement a physiotherapy management protocol for home care for the elderly with osteoarthritis of the hip and knee, in order to improve functional capacity. **Methods:** a study was carried out with a 12-week intervention guideline on 20 participants with a mean age of 72 years. Weight was measured with a scale (omron) and height with a stadiometer (seca) in order to obtain the value of the Body Mass Index (BMI). The exercise guide consists of three phases: first includes isometric exercises; second involves isotonic and resistance exercises; and, third includes balance exercises, gait re-education, reintegration into activities of daily living, a study with initial and final assessment, and instruments to measure functional capacity. The Short Physical Performance Battery (SPPB) was used. It consists of three tests (balance, walking, sitting and standing). The manual dynamometer measures muscle strength in lower limbs and the visual scale measures the perception of pain in the hip and knee. **Results:** the physical exercise guideline in elderlies with hip and knee osteoarthritis improved functional capacity increased muscle strength, and pain perception. **Conclusions:** the exercise protocol increases the functional capacity in the elderly with osteoarthritis of the hip and knee, presenting adequate control in the lower body.

Keywords: home care; elderly; osteoarthritis; lower limbs; intervention program; protocol.**RESUMO**

Introdução: As disfunções musculoesqueléticas da parte inferior do corpo são problemas que afetam os músculos, ossos, articulações, tendões, ligamentos e nervos dos membros inferiores. A osteoartrite do quadril e do joelho é uma doença degenerativa que afeta a cartilagem das articulações do quadril e do joelho. Causa dor, rigidez e limitação de movimentos. **Objetivo:** implementar um protocolo de manejo fisioterapêutico para atendimento domiciliar de idosos com osteoartrite de quadril e joelho, a fim de melhorar a capacidade funcional. **Métodos:** um estudo com roteiro de intervenção de 12 semanas em 20 participantes com idade média de 72 anos foi realizado. O peso foi medido com uma balança (omron) e a altura com um estadiômetro (seca) para obter o valor do Índice de Massa Corporal (IMC). O guia de exercícios consiste em três fases. A primeira fase inclui exercícios isométricos. A segunda fase envolve exercícios isotônicos e de resistência. E a terceira fase inclui exercícios de equilíbrio, reeducação da marcha, reintegração nas atividades de vida diária, estudo com avaliação inicial e final e instrumentos para medir a capacidade funcional. Foi utilizada a Short Physical Performance Battery (SPPB). É composto por três testes (equilíbrio, marcha, sentar e levantar). O dinamômetro manual mede a força muscular em membros inferiores e a escala visual mede a percepção de dor no quadril e joelho. **Resultados:** a diretriz de exercício físico em idosos com osteoartrite de quadril e joelho melhorou a capacidade funcional, aumentou a força muscular e a percepção da dor. **Conclusões:** o protocolo de exercícios aumenta a capacidade funcional em idosos com osteoartrite de quadril e joelho, apresentando controle adequado na parte inferior do corpo.

Palavras-chave: atendimento domiciliar; idosos; osteoartrite; membros inferiores; programa de intervenção; protocolo.**RESUMEN**

Antecedentes Los trastornos musculoesqueléticos de la parte inferior del cuerpo son problemas que afectan músculos, huesos, articulaciones, tendones, ligamentos y nervios de los miembros inferiores. La osteoartritis de cadera y rodilla es una enfermedad degenerativa que afecta el cartílago de las articulaciones de la cadera y la rodilla. Provoca dolor, rigidez y movimiento limitado. **Objetivo:** implementar un protocolo de manejo de fisioterapia para la atención domiciliar del adulto mayor con artrosis de cadera y rodilla, con el fin de mejorar la capacidad funcional. **Métodos:** se realizó un estudio con una pauta de intervención de 12 semanas en 20 participantes con una edad promedio de 72 años. Se midió el peso con una báscula (omron) y la talla con un estadiómetro (seca) para obtener el valor del Índice de Masa Corporal (IMC). La guía de ejercicios consta de tres fases: la primera incluye ejercicios isométricos; el segundo implica ejercicios isotónicos y de resistencia; y, en tercer lugar, se incluyen ejercicios de equilibrio, reeducación de la marcha, reintegración a las actividades de la vida diaria, estudio con valoración inicial y final e instrumentos para medir la capacidad funcional. Se utilizó la Batería Corta de Rendimiento Físico (SPPB). Consta de tres pruebas (equilibrio, caminar, sentarse y pararse). El dinamómetro manual mide la fuerza muscular en los miembros inferiores y la escala visual mide la percepción del dolor en la cadera y la rodilla. **Resultados:** la pauta de ejercicio físico en adultos mayores con artrosis de cadera y rodilla mejoró la capacidad funcional, aumentó la fuerza muscular y la percepción del dolor. **Conclusiones:** el protocolo de ejercicio aumenta la capacidad funcional en ancianos con artrosis de cadera y rodilla, presentando un adecuado control en la parte inferior del cuerpo.

Palabras clave: cuidados en el hogar; adultos mayores; osteoartritis; miembros inferiores; programa de intervención; protocolo.

INTRODUCTION

Osteoarthrosis (OA) is a common variant of arthritis and represents one of the leading causes of physical limitations (Litwic, 2013). It is a degenerative and advanced disease that impacts around 250 million individuals globally. In the United States, its extent exceeds 27 million people (Mora et al, 2018). Joints can be considered as a specialized organ that fulfills an important function in load bearing of the body. Its main elements: articular cartilage and extracellular matrix are fundamental to explain its proper functioning (Wainstein, 2014). Considering the limitation of activities of daily living and current sedentary lifestyle (Conaghan et al, 2015). A connection between OA and the aging process has been evidenced in all epidemiology studies, although little is known about the mechanism that generates this association. Different factors are proposed that could influence this relationship, such as small anatomical modifications in the joints, biomechanical or biochemical alterations in the articular cartilage that affect its mechanical properties, and the severity of the disease, which tends to increase with age. Three theories are proposed: a) overweight increases the pressure on load-bearing joints, b) obesity acts indirectly by inducing metabolic changes such as glucose intolerance, hyperlipemia or variations in bone density, and c) certain dietary components that contribute to weight gain may damage cartilage, bone and other joint structures, so obesity could be studied as a risk factor to be considered (Peña et al, 2007). The aging process is characterized by the gradual decline of physical, cognitive, biological and psychosocial abilities, as well as various physiological processes, after the reproductive stage. As people age, their health is significantly affected (Abreus et al, 2022). Numerous findings have evidenced that various types of structured physical activity programs can have beneficial effects on older adults. They improve their physical, cognitive and hemodynamic function. In fact, it has been proven that older adults can experience improvements in their mobility, transfer capacity, balance, executive capacity and memory, as well as significant decreases in their blood pressure, after following aerobic and resistance exercise training programs (Costa & Dias, 2023; Oliveira et al, 2019). There is a type of practice considered as a workout, which integrates a variety of exercises such as aerobic, muscle strengthening, flexibility, balance and walking in a single session (Borges-Machado, 2021).

In nursing homes, the physical therapist's work is fundamental to improve mobility, movement dysfunctions, pain control, fall prevention and education in manual handling of the elderly. Existing literature has shown that physical therapy is beneficial for older adults in nursing homes. It improves their functional capacity and physical performance by preventing falls and reducing pain. In several countries, including Australia, the United Kingdom, and the United States of America, health legislation and physical activity guidelines recommend physical therapy and exercise to help maintain and restore function in older adults living in nursing homes. However, these recommendations do not specify the minimum number of physical therapists needed, the type of physical therapy, or the duration and frequency needed to achieve these goals (Brett et al, 2019).

The most common conditions and common symptoms in older adults are studied, as well as a proposal for exercise guidelines for people with OA. The participant group were women between 60 and 70 years of age. Information was obtained through medical records and interviews with signed informed consent. The results indicated that OA was the second most common chronic disease and the most common symptoms were morning stiffness and pain, especially on awakening. Two exercise guidelines were developed, but their implementation and evaluation will be shown in subsequent studies (Afre et al, 2019).

The knee and hip joints are the most affected. They often present symptoms such as joint pain, mobility limitations, which can significantly affect quality of life and daily activities. To treat this problem, it is recommended to follow a non-pharmacological approach that includes self-care measures, education about the disease, weight reduction and a therapeutic physical exercise plan (Muñoz-Fonseca, 2022). The most commonly used program for multicomponent training is called Vivifrail (Izquierdo, 2019). In order to give an answer to this research, the following objective was proposed: to implement a protocol of physiotherapeutic home care management for the elderly with hip and knee osteoarthritis to improve functional capacity.

METHODOLOGY

A quantitative study was conducted with a longitudinal cut. The participants were older adults, who are a vulnerable population. The sample group consisted of 20 people older than 65 years of age belonging to the town hospital of the Atahualpa parish, in Ambato city. They had a medical diagnosis of OA of the knee and hip of mild category. The study included older adults between 65 and 90 years of age, men and women, who were not undergoing physiotherapy and who had signed the informed consent form. Older adults with catastrophic diseases, cardiac and respiratory failure, were excluded and those using walking aids and prostheses as well. The exercise model was based on the Short Physical Performance Battery (SPPB) classification of the Vivifrail program. The classification used was: Type A: person with disability (0-3 points); type B: person with frailty (4-6 points); type C: person with pre-frailty (7-9 points) and type D: robust person (10 to 12 points). The participants signed the informed consent before entering the study.

Variables

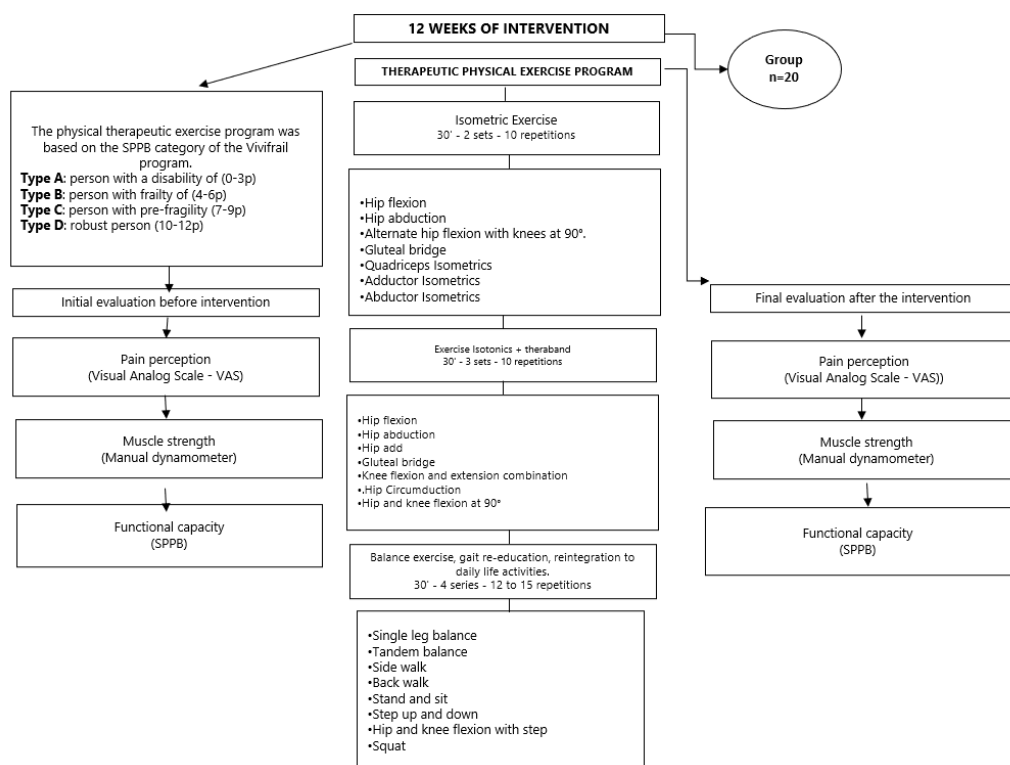
It includes sociodemographic variables such as gender, age and geographic location, as well as anthropometric measurements such as weight, height and body mass index (BMI), which provide information on the health status and lifestyle habits of the participants. The procedure for weight measurement is performed with the minimum amount of clothing and without footwear. The participant was told to be in an upright position, with parallel feet and arms hanging. The scale is *omron* brand. The measurement of height for greater accuracy was carried out in a standing position and without footwear. The stadiometer is *seca* brand. The BMI reference values were: underweight < 18.5 kg/m²; normal weight: 18.5-24.9 kg/m²; overweight: 25.0-29.9 kg/m² and obesity: ≥ 30.0 kg/m². The formula for body mass index is: BMI=weight (kg)/height²(m).

Perception of pain: it was evaluated by Visual Analog Scale (VAS): It is a numerical scale, which rates the intensity of pain from 0 to 10. 0 indicates no pain, 1 to 3: mild-moderate pain, from 4 to 6: moderate-severe pain, from 7 to 9: very intense pain and 10 is the sensation of extreme pain. The participant shows where the pain is currently located on the horizontal line according to his perception. It is measured in rest. This scale was used since it has high reliability through test-retest (r=0.94 to 0.71) and a validity of (r=0.62 to 0.91) (Ubillos-Landa, 2019).

Muscle strength: BASELINE® hydraulic dynamometer was used. It is designed for reliable grip strength assessments from 0 to 200 lbs (0 to 90 kg). It has a dual scale readout display, (lb - kg). Internationally accepted design ensures reliability, user comfort and repeatability of measurement. The needle gives a maximum reading and it remains until the unit is reset. The unit has a blue body and 2-1/2" (inch) analog meter. The handle has an easy manual adjustment to measure lower limb strength. The participant is on a stretcher and the researcher is positioned parallel to the movement to be evaluated which exerts a maximum force without support. The maneuver is repeated twice for each movement leaving a recovery time and registers the maximum value. (Mentiplay, 2015).

Functional capacity (FC): The Short Physical Performance Battery (SPPB) was used. It consists of a set of three tests that assess a person's functional capacity: balance, gait, and the ability to stand up and sit in a chair. Results are based on: Severe functional limitation (0 to 3); Moderate functional limitation (4 to 6); Medium functional limitations (7 to 9); and Minimal functional limitations (10 to 12). The higher the score obtained, the greater the functional capacity of the person. The maximum score is 12 points. Test-retest reliability: 0.88 to 0.92 (Gómez 2013), (Valle, 2022). All variables were measured with initial evaluation and final evaluation of the intervention by a health professional. The exercise protocol for hip and knee osteoarthritis was developed in home care. It had a duration of 12 consecutive weeks. It was established to work in 3 phases. The physiotherapist in charge of the intervention presented the execution of the exercise, doses, implements and general recommendations. The exercises increased progressively in time and intensity (Figure 1).

Figure 1. Characteristics of the intervention design



Source: own elaboration (2023)

Statistical analysis

IBM SPSS software version 25.0 for Windows in was used. The mean and standard deviation were analyzed, after making a data base to tabulate and analyze. The results were presented in figures, tables and Student's t was used to check significance with a value of ($p < 0.05$).

Bioethical Considerations

The Bioethics Committee of the Faculty of Health Sciences of the Technical University of Ambato approved, with resolution COD. 044-CEISH-UTA-2023, ethical measures to ensure patient autonomy and privacy, appropriate clinical practices and the signing of a standardized informed consent.

RESULTS AND DISCUSSION

A study was conducted with 20 older adults, of whom 55% were women and 45% men. The age of the participants ranged from 65 to 90 years. The mean age for women was 68.7 years and for men was 76.1 years. Regarding weight, the mean for women was 73.00 kg and for men was 74.78 kg. The mean height for women was 150.64 cm and for men was 159.44 cm. As for body mass index, 10% of the participants were normal weight, 20% were overweight and 70% were obese (Table 1).

Table 1. Sociodemographic characteristics of the older adults in the town's hospital

	Age (years)	Height (cm)	Weight (kg)	BMI
Female n=11				
Mean	68.73±3.38	150.64±3.61	73±6.88	32.22±3.44
SD				
Male n=45				
Mean	76.11±8.49	159.44±6	74.78±8.21	29.37±2.47
SD				
Total SD	7.11	6.5	7.36	3.33
Total Mean	72.05	154.6	73.8	30.94

Note. Own elaboration with the research data (2023)

As perceived in Table 2, a decrease in pain perception was observed in the participants, as measured by the VAS scale. At the hip level, the mean score decreased from 4.05 to 2.15, while at the knee it decreased from 2.95 to 1.45.

Table 2. Initial and final assessment of pain perception (EVA)

Evaluation	Hip VAS	Knee VAS
	media ± SD	media ± SD
Initial	4.05±1.31	2.95±1.23
Final	2.15±1.09	1.45±1.10
Total p Value	0.000**	0.000**

Abbreviations: hip flexion (FLc), hip extension (EXc), hip abduction (ABDc), hip adduction (ADDc), knee extension (EXr), knee flexion (FLr).

Note. Own elaboration with the research data (2023)

In knee flexion muscle strength, there was no variation with the result of 0.091 in knee flexion. The value is ($p < 0.05$), as shown in Table 3.

Table 3. Initial and final evaluation of muscle strength (manual dynamometer)

Evaluation	FLc strength (Kg)	EXc strength (Kg)	ABDc strength (Kg)	ADDc strength (Kg)	FLr strength (Kg)	EXr strength (Kg)
Initial						
Mean ± SD	7.3±1.75	6.65±2.11	7.15±2.13	6.25±1.83	7.5±1.85	7.4±2.18
Final						
Mean ± SD	8.7±1.75	8.00±2.08	8.35 ± 2.06	7.35±1.79	8.65±1.93	10.15±7.36
p Value	0.000**	0.000**	0.000**	0.000**	0.091	0.000**

Note. Own elaboration with the research data (2023)

Functionality before the intervention showed a validation of 2.9 ± 0.79 and post-intervention was 3.4 ± 0.75 . Thus it improves the functionality of the older adult, as shown in Table 4.

Table 4. Initial and final functional capacity assessment (SPPB)

Evaluation	Short Physical Performance Battery
Initial	
Mean ± DE	2.9±0.79
Final	
Mean ± DE	3.4±0.75
p Value	0.002*

Note. Own elaboration with the research data (2023)

Our study showed that the protocol used was successful in reducing pain and improving functional capacity in the population with osteoarthritis. This finding is significant since osteoarthritis is one of the main causes of disability in older adults, which limits their ability to perform daily activities. It decreases their quality of life and increases the economic and social burden for the family and society. In addition, by offering home care, the protocol improved accessibility and convenience for patients, preventing them from travelling to the clinic or hospital for treatment. It could improve adherence to treatment and therefore the effectiveness of the protocol. It is important to note that in the study by Fernando Muñoz et al. (2022), the SPPB functionality test was used and an improvement in balance and gait was observed. It also included a decrease in pain perception with strengthening exercises. However, it is crucial to keep in mind that osteoarthritis is a chronic and progressive disease, and long-term management is required to maintain positive results. It is also necessary to consider each patient's individual factors, such as their general health status, the severity of osteoarthritis and their personal treatment goals.

In another study conducted by Thompson et al. (2020), a three-month exercise program with two treatment phases was implemented to compare the effects of aerobic and strengthening exercises equally. Phase 1 focused on conditioning, while phase 2 included a gradual increase in workloads and aerobic training. The results of the study indicated that both types of exercise improved physical function, although no significant changes in pain were observed. OA is one of the most frequent musculoskeletal disorders in the elderly. In some cases, the pain persists and in the same way mobility is altered. It can produce incapacity in performing daily life activities. Another important factor to take into account is obesity in the elderly population. This coincides with what was exposed by Kulkarni et al (2016) and Wang & He (2018): high BMI is considered a negative factor in hip and knee joints and obesity is a risk factor in OA. It highlights that it decreases mobility. Regarding the sex of the participants, women predominate in relation to men (Abramoff & Caldera, 2019). Tschon et al. (2021) mention that OA in female sex may be multifactorial, not only with hormonal factors but anatomical, genetic factors and previous injuries. The main results of this study indicate that participants experienced improvements in their functional capacity. This was measured in tests such as tandem balance, walking 4 meters, sitting and standing, as well as in the overall SPPB score. A decrease in pain perception was also observed.

These findings contrast with current evidence suggesting improvements in lower extremity functionality when performing an exercise protocol. These improvements are usually observed in the medium term, after 6 months of intervention. However, our results are consistent with the literature suggesting that the home care protocol is an effective strategy to improve muscle strength, gait and balance (Jimenez et al, 2014). Furthermore, the 12-week intervention period may not have been sufficient to demonstrate maximum effectiveness of the physical exercise program. However, research with similar intervention durations has achieved significant effects (Schäfer et al, 2018).

CONCLUSIONS

The exercise guide for older adults with hip and knee osteoarthritis resulted in a significant improvement in their functional capacity and a reduction in pain sensation. It allows them to access more opportunities and decreases disparities in their health. These findings suggest that the intervention was successful in improving the quality of life of this group of individuals and highlight the importance of a personalized exercise program in improving the health and well-being of the aging population with hip and knee osteoarthritis. Future studies could explore the long-term effectiveness of this exercise guide and its impact on the prevention and management of osteoarthritis in the elderly.

Main limitations of the study and future research

Theoretical limitations of this study might include other factors that could influence the functionality of older people with hip and knee osteoarthritis, such as: mental health, diet or the socioeconomic environment. Moreover, the main methodological limitations include the sample size, which may not be representative of the diversity of the population of elderly people with this condition in Ecuador, as well as the relatively short duration of the study, which may not fully capture the long-term impact of the exercise protocol. Future studies could address these limitations by including additional measures of health and well-being, a more representative sample with a long-term follow-up to evaluate the sustainability of the benefits observed.

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A. theoretical and conceptual foundations and problematization:	50%	15%	15%	10%	10%
B. data research and statistical analysis:	50%	15%	15%	10%	10%
C. elaboration of figures and tables:	50%	15%	15%	10%	10%
D. drafting, reviewing and writing of the text:	50%	15%	15%	10%	10%
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