Analysis of functional status of elderly with osteoarthritis

Análise da funcionalidade de idosos com osteoartrite

Análisis de la funcionalidad de ancianos con osteoartritis

João Paulo M. Santos[1], Rodrigo A. C. Andraus[2], Deise A.A. Pires-Oliveira[3,4], Marcos T.P. Fernandes[5,6], Mayra C. Frâncica[6], Regina Célia Poli-Frederico[3], Karen B.P. Fernandes[3,7]

ABSTRACT | The objective of this study was to analyze the influence of gender, age and pharmacological treatment for osteoarthritis (OA) on the functional status of physically independent elderly. This cross-sectional study involved 105 elder individuals from both genders (age: 68.80±6.3 years) with OA of the hip and / or knee, which was confirmed by radiographic analysis. Two specific instruments assessed functional status: Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Lequesne Index. It was observed worse condition in females in Lequesne (p=0.007), global WOMAC (p=0.013), as well as in its fields: pain intensity (p=0.023), stiffness (p=0.032) and functional status (p=0.018). However, considering age and radiological status, no differences were observed between groups in all variables (p>0.05). It was observed that the individuals with pharmacological treatment for OA have poor functional status in all functional questionnaires (Lequesne, p=0.005; global WOMAC, p=0.008 as well as in specific WOMAC fields, such as Pain intensity, p=0.004; Stifness, p=0.007; and Functional status p=0.023). At multivariate modelo (multiple linear regression), it was observed that gender and pharmacological treatment may influence the functional status of elderly with OA, whereas women and medicated individuals are those showing the worse condition both in Lequesne and WOMAC indexes. It was observed worse functional status in women with osteoarthritis and pharmacological treatment evoked no improvement in functional status of these individuals.

Keywords | Osteoarthritis; Elderly; Disable Persons; Questionnaires.

RESUMO | O objetivo deste estudo foi analisar a influência do gênero, idade e farmacoterapia da osteoartrite (OA) sobre a funcionalidade de idosos. Trata-se de um estudo transversal com 105 idosos de ambos os gêneros (Idade: 70,73±6,0 anos) e portadores de OA de quadril e/ou joelho, confirmado por análise radiográfica. A funcionalidade foi avaliada por dois instrumentos: Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) e Índice Algofuncional de Lequesne. As análises dos dados apresentaram pior funcionalidade tanto no questionário Lequesne (p=0,007) como no WOMAC (p=0,013) e em seus domínios Intensidade da Dor (p=0,013), Rigidez (p=0,032) e Funcionalidade (p=0,018). Contudo, não foram verificadas diferenças nos instrumentos avaliados quanto a diferentes faixas etárias ou comprometimento da articulação segundo alterações radiográficas (p>0,05). Foi observado que os medicados apresentavam pior funcionalidade em comparação aos que não utilizavam medicamentos para OA (Lequesne: p=0,005; WOMAC: p=0,008 e domínios: Intensidade da Dor: p=0,004; Rigidez: p=0,007 e Funcionalidade: p=0,023). No modelo multivariado, foi observado que o gênero e o tratamento farmacológico influenciam a funcionalidade de idosos portadores de OA (p<0,05), sendo as mulheres e os indivíduos medicados os que apresentam pior funcionalidade tanto no índice Lequesne quanto WOMAC. Observou-se pior funcionalidade em idosas portadoras de OA e que o uso de medicamentos para osteoartrite não promoveu melhora na condição funcional desses indivíduos.

Descritores | Osteoartrite; Idoso; Pessoas com deficiência; Questionários.

[1]Student, Doctorate, UEL/UNOPAR Associate Post-Graduation Program in Rehabilitation Sciences – Londrina (PR), Brazil.
[2]Student, Post-Doctorate, UEL/UNOPAR Associate Post-Graduation Program in Rehabilitation Sciences – Londrina (PR), Brazil.
[3]Professor in the UEL/UNOPAR Associate Post-Graduation Program in Rehabilitation Sciences – Londrina (PR), Brazil.
[4]Professor in UNOPAR's Professional Master's Degree Course in Physical Exercise as a Health Promoter – Londrina (PR), Brazil.
[5]Associate Doctor, Irmandade Santa Casa de Londrina (ISCAL) – Londrina (PR), Brazil.
[6]Student, UEL/UNOPAR Associate Post-Graduation Program in Rehabilitation Sciences – Londrina (PR), Brazil.
[7]Assistant Professor, Medical School / Pontifícia Universidade Católica do Paraná – Londrina (PR), Brazil.

RESUMEN | En este estudio se analiza la influencia del género, de la edad y del tratamiento farmacológico para la osteoartritis (OA) en la funcionalidad de las personas mayores. Se trata de un estudio transversal, lo cual 105 personas mayores han participado de ambos géneros (Edad: 70,73±6,0 años) con OA de cadera y/o rodilla confirmado por el análisis radiográfico. Se valoró la funcionalidad bajo dos instrumentos: Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) e Índice Algofuncional de Lequesne. En el análisis de datos se mostró peor funcionalidad tanto en el cuestionario Lequesne (p=0,007) como en el WOMAC (p=0,013) y en sus dominios intensidad de dolor (p=0,013), rigidez (p=0,032) y funcionalidad (p=0,018). No obstante, no se comprobaron diferencias en estos instrumentos en relación a las distintas franjas etarias o a la alteración de la articulación, de acuerdo a los indicios en la radiografía (p>0,05). Se observó que los que fueron tratados con medicamentos para la OA presentaban funcionalidad peor que los que no lo utilizaban (Lequesne, p=0,005; WOMAC, p=0,008; y dominios: intensidad de dolor, p=0,004; rigidez, p=0,007 y funcionalidad p=0,023). En el modelo multivariante, se observó que el género y el tratamiento farmacológico influyeron en la funcionalidad de las personas mayores con OA (p<0,05), siendo las mujeres y los sujetos tratados con medicamentos los que más presentaron peor funcionalidad tanto en el índice Lequesne como en el WOMAC, lo que muestra que el uso de medicamentos no mejoraron la condición funcional de estos.

Palabras clave | Osteoartritis; Personas mayores; Personas discapacitadas; Cuestionarios.

INTRODUCTION

The aging process is a worldwide reality which affects people from both developed and developing countries. In Brazil, between years 2002 and 2010, the number of elderly people was observed to increase by approximately 3 million[1].

Population aging brings new challenges to the health care system, and elderly people suffering from uncontrolled, improperly treated chronic diseases are more subject to disease-related sequelae and disabilities. The declined quality of life is the final consequence of a series of events[2] which negatively affect the life of patients undergoing those conditions, and that burdens public health care services even further[3].

Osteoarthritis (OA) is a degenerative joint disease whose consequences lead to great socioeconomic impacts. Around 40% of adults who are older than 70 years are found to have OA, and 80% of people with the disease suffer from some kind of limited motion[4]. Clinically, OA is found to have a great variation of signs and symptoms, of which the most frequent are stiffness, discomfort, and pain, and it can also lead to deformities[5].

Most OA patients suffer from great changes in their activities of daily living (ADL), and approximately 25% of them are found to have some kind of functional limitation, such as morning stiffness, reduced joint motion, crepitus, and muscle atrophy[5]. Thus, OA becomes a very common cause for disabilities, and it is considered a great social problem, as it leads to a higher risk for hospitalization and to high costs to health care services[6].

Studying functional ability is required to support patients' independence[6], and it has been rising as key to evaluate the health status of elderly people.

With the evolution in the pharmacological treatment of OA, in addition to the (analgesic or anti-inflammatory) conventional medications which treat its symptoms, new drugs have been developed, such as the combination between Chondroitin and Glucosamine, which are capable of altering the process of joint degeneration, thus slowing down the disease progression[7].

Considering that different treatments may trigger several responses, initially depending on a patient's health status[7], there is no consensus in regards to the clinical efficiency of different drug treatments for OA, especially concerning their ability to improve function in people who suffer from that disease. Function in OA patients is generally assessed through questionnaires, and that method is simple and capable of evaluating a patient's opinion on their disabilities[12,13]. In this context, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Lequesne Index[14,15] are the most used ones.

WOMAC is the most adequate questionnaire to evaluate physical limitations[14]. It is widely employed in the United States and Canada[12,14] and highly recommended by the American College of Rheumatology and by the Osteoarthritis Research Society International, including as an instrument to assess pain and disability in clinical tests with osteoarthritic patients[11].

Lequesne Index was developed in France in the 1970s, and it is internationally recommended by the World health Organization (WHO) and by the European League against Rheumatism for the evaluation of hip and keen joints[15,16]. Thus, this study aimed to analyze the influences of gender, age, body mass index, and pharmacotherapy in OA on the functional ability of elderly people suffering from OA, through WOMAC and Lequesne Algofunctional Index.

METHODOLOGY

Study Type

This study is characterized as cross-sectional, descriptive, and observational, with samples which originate from secondary data from *EELO - Estudo do Envelhecimento e Longevidade* (Study on Aging and Longevity) project. In this theme project, socio-demographic and health status aspects of the elderly population in the municipality of Londrina (PR state, Brazil) were evaluated. That medium-sized municipality (506,701 inhabitants) has a 12% share of elderly people as compared to the general population, and that index exceeds the national average, being similar to the ratio of elderly people in developed countries[8].

Ethical Aspects

This project was approved by the University Research Ethics Committee (Official Opinion no. 135.016). Selected subjects signed consent forms (*Termo de Consentimento Livre e Esclarecido*) which included information on the procedures and goals of the studies, as well as its legal and ethical aspects.

Criteria for Eligibility

The study inclusion criteria were the following: being of old age (60 years or older); being part of *EELO* project; having been self-reported with hip and/or knee OA (as confirmed through radiographic analysis by a specialist physician, as per the criteria established by Vasconcelos et al. [9]; and not being undergoing physical therapy treatment. The adopted exclusion criteria were the following: suffering from other rheumatic diseases, advanced osteoporosis, having undergone hip or knee arthroplasty, having CVA or Parkinson's disease symptoms.

Evaluation of function

Two instruments were used in order to evaluate function in osteoarthritic elderly people, and both are internationally recommended by WHO as means to assess knee and hip osteoarthritis in both drug trials and drug-free treatments. WOMAC questionnaire, comprising questions on pain, joint stiffness, and function was the first. In it, the highest score represents a patient's worst status. It has been translated and validated into a Portuguese version, and it represents the gold standard for evaluating osteoarthritic elderly people[10]. The other instrument that was used was Lequesne Algofunctional Index (previously translated and validated into Portuguese). It contains 11 questions involving pain, discomfort, and limited function, focusing on limitations, pain, and on walked distances[15].

Evaluation of radiographic results

Kellgren and Lawrence's [17] criteria were used to analyze the radiographic results. Grade 0 means no radiographic alterations; grade I implies narrowing of the doubtful joint space and possible osteophytes around the edge; grade II implies possible narrowing of the joint space and definite osteophytes; grade III defines the narrowing of the joint space, multiple moderate osteophytes, some subchondral sclerosis, and possible deformities in bone outline, and grade IV means narrowing of the joint space, severe subchondral sclerosis, defined deformity in bone outline, and presence of large osteophytes. Based on that, the groups were classified as: no radiographic alterations (grade 0), with mild alterations (grades I and II), and with severe alterations (grades III and IV)[18].

Statistical analysis

GraphPad Prism 5.0 was used to analyze results statistically, and a 95% confidence interval was adopted for all applied tests, as well as a 5% significance level ($p < 0.05$). Considering the non-parametric nature of dependent variables (WOMAC and Lequesne Algofunctional Index), non-parametric Mann-Whitney test was used to compare the groups in regards to genders and age ranges, and to analyze the pharmacotherapy

concerning the radiographic classification for osteoarthritis. Besides that, a multiple linear regression model was performed in order to check for the influence of variables gender, age, pharmacotherapy, BMI, and radiographic classification concerning function.

RESULTS

Sample characterization

105 elderly subjects took part in this study. They had been self-reported as having OA, and comprised 32 men (30.5%) and women (69.5%) with an average age of 70.73±6.0 years and body mass index of 28.71±5.1. In regards to the radiographic results, 37 patients (35.2%) were found to have no radiographic alterations, 45 (42.9%) were found to have mild alterations, and 17 displayed severe alterations. It was not possible to classify one of the patients due to a failure in their radiographic exam. In regards to the drug therapy for osteoarthritis, 64 patients (61%) were not observed to be making use of drugs for osteoarthritis, whereas 41 (39.0%) were found to be using them.

Influence of gender and age on function

In regards to genders, the worst functional scores were found for women, both as per WOMAC and Lequesne indices (p<0.05). The data are shown in Table 1. Concerning the age range, no association between age and function of osteoarthriticelderlypeoplewasfoundinthestudiedpopulation (Mann–Whitney U test, p>0.05). The data are shown in Table 2.

Table 1. Analysis of the gender-related influence on the functional ability of osteoarthritic elderly people

	Gender	Median	1st Quartile	3rd Quartile	p
Global WOMAC	Masculine	15.50	5.35	38.75	0.013*
	Feminine	31.00	15.50	49.00	
WOMAC Intensity	Masculine	4.50	1.25	6.75	0.023*
	Feminine	7.00	2.50	10.00	
WOMAC Stiffness	Masculine	1.00	0.00	3.75	0.032*
	Feminine	2.00	1.00	4.00	

Continues...

Table 1. *Continuation*

	Gender	Median	1st Quartile	3rd Quartile	p
WOMAC Functional Ability	Masculine	11.00	3.00	24.75	0.018*
	Feminine	23.00	10.00	32.50	
Lequesne	Masculine	8.00	4.00	13.00	0.007*
	Feminine	13.00	7.25	17.75	

* Statistically significant: Mann–Whitney U test

Table 2. Analysis of the influence of age ranges on the functional ability of osteoarthritic elderly people

	Age range	Median	1st Quartile	3rd Quartile	p
Global WOMAC	60-69 years	30.00	14.50	43.50	0.394
	> 70 years	24.50	8.25	66.06	n.s.
WOMAC Intensity	60-69 years	7.00	4.00	10.00	0.090
	> 70 years	5.00	1.25	87.18	n.s.
WOMAC Stiffness	60-69 years	2.00	0.00	4.00	0.450
	> 70 years	1.00	6.25	46.50	n.s.
WOMAC Functional Ability	60-69 years	22.00	8.00	31.50	0.397
	> 70 years	17.50	4.62	9.00	n.s.
Lequesne	60-69 years	11.00	7.250	17.000	0.944
	> 70 years	11.75	35.75	4.00	n.s.

n.s.: statistically non-significant

Influence of osteoarthritis pharmacotherapy on functional ability according to the presence of radiographic alterations

In the group of patients with radiographic alterations, better results were observed in WOMAC (p=0.008) and in its domains regarding Intensity (p=0.004), Stiffness (p=0.007), and Physical Activity (p=0.023); as well as in Lequesne Algofunctional Index (p=0.005) in subjects treated with no drugs. Those data are shown in Table 3.

In the group of patients with mild alterations, no influence from osteoarthritis pharmacotherapy was observed in regards to WOMAC (p=0.339) and in its domains Intensity (p=0.171), Stiffness (p=0.517), and Physical Activity (p=0.486). Similarly, no differences were observed in Lequesne Algofunctional Index either (p=0,110).

Similar data were observed in the group of patients with severe radiographic alterations, to whom drug treatments were not effective either, as

no significant differences were observed in WOMAC (p=0.130) either, or in its domains Intensity (p=0.202), Stiffness (p=0.190), and Physical Activity (p=0.187). No differences were found either in Lequesne Algofunctional Index (p=0.406).

Association among gender, age, pharmacotherapy, BMI, and radiographic classification in regards to function

In the multivariate analysis (multiple linear regression, Table 4), a positive association was found between Lequesne Algofunctional Index and the model comprising BMI, gender, pharmacotherapy, and radiographic classification (p=0.004), and the association among those variables accounted for 21.8% of the variance in this index (R^2). The regression coefficient was statistically significant for pharmacotherapy (Adjusted Beta=0.33; p=0.01) and gender (Adjusted Beta=0.13; p=0.038). However, no statistic significance was observed for the remaining variables age (Adjusted Beta=0.04; p=0.977), radiographic classification (Adjusted Beta=0.07; p=0.461), and BMI (Adjusted Beta=0.132; p=0.227).

In regards to WOMAC index, a similar association among those variables was found with the multivariate analysis model (p = 0.002), and jointly they accounted for 21.6% of the variance in this index (R^2). As it was for Lequesne, the correlation coefficient was statistically

Table 3. Analysis of the influence from osteoarthritis medications on functional ability

Radiographic Results	Instruments	Medication	Quartiles			p
No alterations	Lequesne	No	5.25	8.00	11.50	0.005*
		Yes	10.62	15.25	19.75	
	WOMAC (Total)	No	8.00	21.00	30.00	0.008*
		Yes	22.00	42.50	58.00	
	WOMAC (Intensity)	No	1.00	5.00	8.00	0.004*
		Yes	6.00	9.50	12.75	
	WOMAC (Stiffness)	No	0.50	1.00	2.00	0.007*
		Yes	1.25	4.00	5.75	
	WOMAC (Physical Activity)	No	4.50	13.00	21.50	0.023*
		Yes	14.75	28.50	44.25	
Mild alterations	Lequesne	No	6.00	11.50	16.00	0.110 n.s.
		Yes	6.50	20.50	23.75	
	WOMAC (Total)	No	10.00	23.00	47.00	0.339 n.s.
		Yes	16.50	42.00	60.50	
	WOMAC (Intensity)	No	2.00	5.00	9.00	0.171 n.s.
		Yes	4.00	9.00	13.50	
	WOMAC (Stiffness)	No	0.00	1.00	4.00	0.517 n.s.
		Yes	0.00	2.00	4.00	
	WOMAC (Physical Activity)	No	8.00	16.00	32.00	0.486 n.s.
		Yes	11.50	28.00	38.50	
Severe alterations	Lequesne	No	6.62	10.25	17.00	0.406 n.s.
		Yes	14.50	16.00	17.50	
	WOMAC (Total)	No	9.50	24.00	38.50	0.130 n.s.
		Yes	31.00	43.00	54.00	
	WOMAC (Intensity)	No	1.00	4.00	7.25	0.202 n.s.
		Yes	5.00	8.00	10.00	
	WOMAC (Stiffness)	No	0.75	1.50	4.00	0.190 n.s.
		Yes	0.00	4.00	6.00	
	WOMAC (Physical Activity)	No	7.75	16.50	30.50	0.187 n.s.
		Yes	21.00	31.00	40.00	

* Statistically significant: Kruskall-Walis Test

n.s.: statistically non-significant

significant for gender (Adjusted Beta=0.22; p=0.038) and pharmacotherapy (Adjusted Beta=0.034; p=0.001). However, for radiographic classification (Adjusted Beta=0.076; p=0.461), age (Adjusted Beta=0.003; p=0.977), and BMI (Adjusted Beta=0.132; p=0.227), no statistically significant correlations were observed to be found.

Table 4. Multivariate analysis of factors determining function in osteoarthritic elderly people

	Independent variables	Adjusted Beta	p
Lequesne	Gender	0.13	0.004*
	Age	0.04	0.64 n.s.
	BMI	0.13	0.22 n.s.
	Pharmacotherapy for OA	0.33	0.001*
	Presence of radiographic damage	0.07	0.46 n.s.
WOMAC	Gender	0.22	0.04*
	Age	0.003	0.97 n.s.
	BMI	0.13	0.22*
	Pharmacotherapy for OA	0.33	0.001*
	Presence of radiographic damage	0.07	0.46 n.s.

* Statistically significant; Multiple Linear Regression
n.s.: statistically non-significant

DISCUSSION

In this study, the feminine gender was found to have worse functional ability indicators in (Global and Stratified) WOMAC and Lequesne questionnaires. Those data corroborate other studies which point out a higher share of OA in the feminine gender[21]. Besides that, women are generally more exposed to the effects from joint degeneration, once OA has an early onset in the feminine gender[18]. That fact could be explained by the fact that women have smaller joint cartilage in their proximal tibial and patellar regions[19], which could justify the high pain indices in women who are afflicted with OA[20].

In the analysis per age ranges, no age-related influences were found on the functional ability of the population in this study. However, there are data which stray from that explanation, in which positive correlation is found among age, disease duration, severity, and symptoms[18].

When functional ability was analyzed in regards to the use of OA pharmacotherapy, it was not observed to be efficient in improving the function of osteoarthritic elderly people, and that disagrees with the study by Selvan et al.[22], who reported improved pain, stiffness, and physical ability with the drug treatment for

osteoarthritis. The discrepancy between those results can be explained by differences in the patients' ages, once Selvan et al.[22] dealt with adult and elderly people, and the drug treatment that was administered to patients was the combination between glucosamine and nonsteroidal anti-inflammatory drugs.

That lack of therapeutic efficiency may be understood due to the multifactorial character of osteoarthritis pathogenesis. It is important to point out that several mediators, such as the cytokines (IL1-β, TNF-α, and IL-6), play an important role as mediators for the inflammatory process and joint damage in osteoarthritis. Those cytokines are produced by chondrocytes, mononuclear cells, osteoblasts, and synovial tissues, inducing the production of several inflammatory and catabolic factors[23]. Nonetheless, the current therapies, such as the use of anti-inflammatory drugs and the combination between chondroitin/ glucosamine, are limited and many times not enough to prevent the onset and especially the disease progression, once they do not modulate the release or the action from those cytokines.

Functional ability may have an impact in the life of those elderly people, as the associated pain hinders their mobility, which results in disadvantages and in worsened social integration. Those disabilities are pointed out to increase anxiety and dismay, and they may lead to the onset of clinical depression[24]. Thus, elderly people start perceiving their mental health as worsened, as they are found to have persistent pain, which can trigger a clinical depression process. The relationship between functional ability and clinical depression is noticed to be possibly mediated by pain. Thus, depression and anxiety may intensify OA effects, as they increase pain and functional limitations, and keep patients from adhering to drug treatments[25].

WHO estimates that 25% of people over 65 years of age suffer from OA-related pain and disability. Pain, inflammation, degeneration and joint stiffness, which are simultaneous to the musculoskeletal deficiencies osteoarthritic patients suffer from, promote disabilities, especially in activities regarding climbing stairs up or down, standing, walking, squatting, and kneeling. They also reduce the muscle strength related to balance and coordination[26]. In a systematic review that is associated to these results, increased pain prevalence in knee OA has been observed over the last few years, which is probably due to higher mechanical demands knees are exposed to[27].

Healthy aging may have important implications in elderly people's lives, as it is related to the capability of performing professionally until later in life or to one's ability to occupy oneself with pleasant activities[28].

There is some evidence pointing towards divergences between functional impairment and radiographic results. In this context, whereas some studies reported associations among age, disease duration, and radiographic results showing agreement between pain and disease severity[18], other found no relationship between radiographic results and function in osteoarthritic patients[29]. Although the radiographic results are found to display correlation between age and disease duration, the lack of correlation between pain and radiographic results may be explained by the fact that possible damage in the patellofemoral compartment and in the soft tissues is not generally shown in radiographic exams[27].

As limitations in this study, one may point out that no functional tests were used to identify the limitations in those osteoarthritic patients. Besides that, those patients were not supervised or analyzed throughout time. Therefore, future studies are required to confirm the described hypotheses. Besides that, the low number of subjects being treated with the combination between Chondroitin and Glucosamine reinforces the importance for searching new therapeutic approaches for osteoarthritis.

Considering that the identified radiographic alterations not always reflect the functional status, the severity classification that is only based in the radiographic analysis is pointed out to possibly lead to an improper use of drug treatments, many times promoting undesired effects or lack of therapeutic efficiency[25].

In this context, the use of validated questionnaires or functional tests should be part of the functional assessment of patients suffering from osteoarthritis. Besides that, the inclusion of those patients in rehabilitation programs which focus on the performance of balance-improving exercises, stretching, and strengthening of the most damaged muscle groups could be a feasible measure in order to contribute to the promotion of health for osteoarthritic elderly people[29].

CONCLUSION

Worse function was observed in elderly women suffering from OA, and the drug treatment promoted no improvements in the functional statuses of those patients. In this context, studies on different therapeutic modalities aiming to improve function and quality of life for elderly people must be fostered.

In order to assess functional ability in elderly women, it is interesting that research and clinical interventions are performed with a focus on muscle strengthening, balance, and flexibility, in order that functional ability be improved.

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