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Original article

Comparative study of functional capacity and quality of life among obese and non-obese elderly people with knee osteoarthritis

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ABSTRACT

Introduction: The association between osteoarthritis (OA) and obesity can lead to a reduced functional capacity, compromising the quality of life (QoL) of the elderly.
Objective: To compare the functional capacity and QoL of obese and non-obese older adults with knee OA.
Methods: The sample consisted of 35 subjects with OA divided into two groups, obese and non-obese subjects, according to their body mass index. To assess functional capacity, performance tests such as Timed Up and Go (TUG), gait speed test, and the six-minute walk test (6 MWT) were carried out. To assess QoL, WOMAC and SF-36 questionnaires were administered. We performed descriptive and inferential statistics using SPSS software version 20.0.
Results: Elderly patients with OA were divided into two groups (obese, $n = 16$; non-obese, $n = 19$). Socio-demographic characteristics were similar between groups ($p > 0.05$). The obese group showed a worst performance in TUG, brisk walking speed and 6 MWT. A more severe pain was found in the following items: "performing heavy housework chores", "going down stairs", "bending to floor" and "getting up from bed" in the obese group ($p < 0.05$). In addition, the obese group had more difficulty to perform tasks for the following items: "going down stairs", "rising from a chair", "standing" and "getting on/off toilet" ($p < 0.05$). There was no statistically significant difference in the assessed domains of SF-36 between groups ($p > 0.05$).
Conclusion: OA associated with obesity caused a negative impact on functional capacity; however, quality of life scores were low, and no difference in obese and non-obese subjects was found.

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Estudo comparativo da capacidade funcional e qualidade de vida entre idosos com osteoartrite de joelho obesos e não obesos

Palavras-chave:
Idosos
Osteoartrite
Obesidade
Qualidade de vida

RESUMO

Introdução: A associação entre osteoartrite (OA) e obesidade pode gerar redução da capacidade funcional e comprometer a qualidade de vida (QV) de idosos.Objetivo Comparar a capacidade funcional e a QV entre idosos com OA no joelho, obesos e não obesos.
Métodos: A amostra foi constituída por 35 idosos com OA divididos em dois grupos, obesos e não obesos, de acordo com o índice de massa corporal. Para avaliação da capacidade funcional foram feitos testes de desempenho, como Timed Up and Go (TUG), velocidade da marcha e teste de caminhada de seis minutos (TC6). Para avaliação da QV foram aplicados os questionários WOMAC e SF-36. Foi feita estatística descritiva e inferencial com o uso do *software* SPSS versão 20.0.
Resultados: Os idosos com OA foram divididos em dois grupos (obesos, n = 16) e (não obesos, n = 19). As características sociodemográficas foram similares entre os grupos ($p > 0,05$). Foi observada redução de desempenho no TUG, velocidade da marcha rápida e TC6, com maior intensidade de dor nos itens: "executar tarefas domésticas pesadas", "descer escadas", "curvar-se em direção ao chão" e "levantar-se da cama" no grupo dos obesos ($p < 0,05$). Além disso, o grupo de obesos apresentou maior dificuldade ao executar tarefas para os itens: "descer escadas", "levantar da cadeira", "ficar de pé" e "sentar/levantar do vaso sanitaria" ($p < 0,05$). Não foi observada diferença estatisticamente significativa nos domínios avaliados do SF-36 entre os grupos ($p > 0,05$).
Conclusão: A OA associada à obesidade impactou negativamente a capacidade functional. Entretanto, os escores de QV foram baixos sem diferença para obesos e não obesos.

Introduction

During the aging process, functional losses occur, which are accentuated due to the lack of activity of the neuromuscular system and to reduced muscle strength and fitness. In addition to the decrease of functionality, the elderly lose more acutely the ability to retain water and to produce proteoglycans, causing degenerative joint disorders such as osteoarthritis (OA).[1–3]

One of the risk factors for OA is obesity. In addition to being a risk factor for OA, the association between OA and obesity can increase the intensity of pain and functional limitations due to increased weight bearing on the affected joint, with narrowing of the intra-articular space. This scenario may cause an increase in pain in the joint, stiffness and muscle atrophy.[4,5] In a recent meta-analysis that assessed the risk for onset of OA, Blagojevic et al.[6] report that obese people have a threefold risk of developing OA *versus* non-overweight individuals.

Excessive weight increases both blood pressure and the stress incident on the joint, activating joint cartilage degradation, subchondral bone sclerosis and osteophyte formation mechanisms, and leading to OA worsening.[7–9] These factors can negatively impact the quality of life (QoL) of obese elderly affected by the disease.[10]

OA alone or in conjunction with obesity is associated with increased risk of morbidity and mortality, and this may impair the QoL of elderly people with this disease. An essential attribute in the health of the elderly is their functional capacity, this being a key component of overall health assessment.[11] In addition to being a risk factor for OA, obesity can worsen symptoms and exacerbate the functional decline of elderly patients with OA. An understanding of those factors that interfere with the functioning and QoL of elderly patients with OA can contribute to the formulation of strategies for its prevention and treatment. Therefore, this study aimed to compare the functional capacity and QoL of obese and non-obese elderly patients with knee OA.

Materials and methods

A quantitative, analytical, cross-sectional study was conducted with a non-probabilistic sample. Thirty-five elderly patients, 29 (82.85%) of them female, mean age of 66.57 ± 7.38 (60–86) years, with knee OA diagnosed by a medical specialist within five years and with independent ambulation were included in this study.

These patients were referred by a physician for physical therapy in a physical therapy teaching clinic in the city of Lauro de Freitas, Bahia. Patients on a waiting list of the clinic who had not started their physical therapy program were included. Seniors who presented a cognitive deficit (those subjects showing difficulties in answering the questions in the questionnaire), an associated disease previously diagnosed, presence of arthroplasty in one or both knees, patients with joint inflammation at the time of assessment, and patients who underwent physical therapeutic care in the past 6 months were excluded.

Before starting data collection, the elderly were informed about the study and its purposes and signed an informed consent form. The study was approved by the Research Ethics

Committee of a higher education institution and approved by opinion No. 3,017.

For a body mass index (BMI) evaluation, a scale and a measuring tape were used for measurements of body weight and height. After the measurements, BMI calculation was performed according to the criteria established by the World Health Organization (WHO), that is, the product of dividing body weight by height squared (kg/m^2).[12] According to WHO criteria, individuals with a BMI above 30 kg/m^2 were considered obese.

According to the measured values of BMI, our patients were divided into two groups, obese and non-obese subjects. To assess functional capacity, three performance tests were applied. For the testing, standardized instructions as described in the literature[13–16] were followed. The tests used were: Timed Up and Go (TUG),[13] gait speed test[14] and six-minute walk test (6MWT).[15,16]

To evaluate QoL, two questionnaires were used: the Westerm Ontario and McMaster Universities (WOMAC) and the generic SF-36 – Medical Outcomes Study 36-Item Short-Form Health Survey, both in the Brazilian version, already adapted and validated in Brazil.[10,17,18]

The SF-36 questionnaire contains 36 questions that are grouped into eight domains, whose scores range from 0 to 100, where zero corresponds to the worst general state of health and 100 to the best state, meaning that the higher the total score, the better the perception of quality of life.[17,18]

WOMAC is a three-dimensional (pain, stiffness and physical function) quality of life questionnaire specifically for the evaluation of patients with OA. WOMAC records the perception of pain, joint stiffness and functionality, based on the 48 h preceding its application. The WOMAC score is assigned in a Likert-type scale, ranging from 0 to 4; the higher the score, the worse the pain, joint stiffness and functionality.[19]

Descriptive statistics were used in the analysis of demographic and clinical data. Data of continuous variables were analyzed with measures of central tendency and dispersion, expressed as mean, median and standard deviation. Data from dichotomous and categorical variables were analyzed with frequency measures and expressed as percentages.

For testing normality, the Shapiro–Wilk test was performed for all variables. For normally distributed data, the Student's *t* test for independent samples was used to compare mean differences of variables between groups. For variables with non-parametric distribution, the Mann–Whitney test was used to compare differences of the medians between groups. The significance level was set at 5%. Statistical analysis was performed using SPSS (Statistical Package for Social Sciences) software for Windows (version 20.0).

Results

Thirty-five elderly patients with mean age of 66.57 ± 7.38 years, ranging from 60–86 years, were evaluated. According to BMI the elderly were divided into two groups: obese ($n = 16$) and non-obese ($n = 19$). There was no statistically significant difference in socio-demographic characteristics and OA duration between groups ($p > 0.05$). Socio-demographic data are presented in Table 1.

Table 1 – Socio-demographic and clinical characteristics of the obese and non-obese groups.

Variable	Obese Mean ± SD	Non-obese Mean ± SD	*p*-Value
Age (years)	66.12 ± 7.24	66.94 ± 7.67	0.748
BMI	33.29 ± 3.15	23.16 ± 3.18	0.001
Duration of OA	2.87 ± 0.71	2.94 ± 0.70	0.766
Gender			
Male	3 (18.8%)	3 (15.8%)	
Female	13 (81.2%)	16 (84.2%)	0.516

BMI, body mass index; OA, Osteoarthritis; SD, standard deviation.

Table 2 – Functional capacity among obese and non-obese patients with osteoarthritis.

Variable	Obese Mean ± SD	Non-obese Mean ± SD	*p*-Value
6MWT (m)	298.69 ± 50.10	354.97 ± 67.97	0.010
TUG (s)	8.86 ± 1.83	7.04 ± 0.83	0.002
Customary gait (m/s)	1.10 ± 0.09	1.14 ± 0.12	0.318
Brisk gait (m/s)	1.34 ± 0.12	1.56 ± 0.17	0.001

6MWT, six-minute walk test; TUG, Timed Up and Go test; Gait speed (customary and brisk); SD, standard deviation.

Statistically significant difference was found between groups ($p < 0.05$) in tests assessing functional capacity. The means obtained by the group of non-obese elderly were better for TUG, fast gait speed and 6MWT. On the other hand, no statistically significant difference between groups was found in the customary speed test. Mean values are shown in Table 2.

As to the pain severity domain of WOMAC questionnaire, a more intense pain was identified for the items: "walking", "climbing stairs", "carrying a heavy weight" and "night pain". The obese group had a higher pain intensity in items "climbing stairs" and "night pain" ($p < 0.05$).

In the "difficulties in performing tasks" domain, a greater difficulty was perceived by the elderly for the items: "performing heavy housework chores", "going down stairs", "bending to the floor" and "rising from bed." Compared to the group of non-obese subjects, the obese elderly found more difficulty ($p < 0.05$) in the items: "going down stairs", "rising from a chair", "standing" and "getting on/off toilet." The percentages of pain intensity and difficulty to perform activities are listed in Tables 3 and 4.

Table 3 – Pain severity according to WOMAC score.

Variable	Obese	Non-obese
Walking	75%	73.68%
Climbing stairs	93.75%	78.94%[a]
Night pain	81.25%	36.84%[a]
Pain at rest	50%	36.84%
When carrying weight	93.75%	84.21%
Morning stiffness	87.50%	78.94%
Protokinetic stiffness	68.75%	57.89%

[a] $p < 0.05$.

Table 4 – Physical function according to WOMAC score.

Variable	Obese	Non-obese
Stair use	87.50%	63.15%[a]
Rising from sitting	62.50%	36.84%[a]
Standing	62.50%	36.84%[a]
Bending	87.50%	94.73%
Walking on a flat surface	43.75%	26.31%
Getting in/out of a car	75%	73.68%
Going shopping	50%	42.10%
Putting on socks/stockings	68.75%	52.63%
Rising from bed	78.75%	33.15%[a]
Taking off socks/stockings	68.75%	42.10%
Lying in bed	37.50%	26.31%
Getting in/out of bath	12.50%	0%
Sitting	37.50%	31.57%
Getting on/off toilet	62.50%	37.89%[a]
Light household duties	37.50%	31.57%
Heavy household duties	100%	100%

[a] $p < 0.05$.

Table 5 – Mean and standard deviation of domains assessed by SF-36.

Domain	Obese	Non-obese
Physical functioning	52.18 ± 24.76	64.21 ± 16.60
Role limitations due to physical health	32.37 ± 31.45	32.89 ± 40.86
Bodily pain	36.87 ± 17.01	44.21 ± 19.23
General health	52.81 ± 13.90	57.89 ± 17.89
Vitality	55.31 ± 8.26	56.57 ± 11.31
Social functioning	45.31 ± 15.05	47.36 ± 9.84
Role limitations due to emotional problems	31.24 ± 37.45	49.12 ± 43.55
Mental health	51.75 ± 9.84	57.47 ± 10.43

There was no statistically significant difference in any of the SF-36 domains between groups ($p > 0.05$), but a reduced score in QoL was noted. The scores are presented in Table 5.

Discussion

Obese seniors with OA have reduced functional capacity, higher level of pain and difficulty in performing everyday tasks that require effort; these changes may be associated with the increased body mass and consequent joint overload. The joint overload limits the movements and increases joint stress, which can generate higher levels of disability in obese seniors.[2] Thus, this population are at increased risk for the development of pain and functional difficulty, when compared to non-obese subjects.

In this study, obese older adults with OA showed a higher level of pain and difficulty in some functional activities, such as climbing and descending stairs, getting out of bed, and bending toward the floor. In the study by Heo et al.[20] it became apparent the association of increased BMI with increased joint pain; this finding is in line with results of Vasconcelos et al.[21] study; these authors report that difficulties with physical function is related to mobility activities that require movement and weight-bearing in their joints.

Regarding functional capacity, non-obese subjects achieved better outcomes in mobility, brisk walking and conditioning. Greater speed and less time required for these tests may cause excessive stress to the knee joint, overloading the joint and contributing to poor performance of obese individuals, since these people use a strategy of a lower gait speed to reduce pain and joint impact.[22]

Rosemann et al.[23] evaluated the impact of OA on 978 patients; functional capacity was reduced in those patients with weight gain, however, there was no difference in the evaluated domains of QoL among overweight and non-overweight subjects, corroborating the results of this study. Our results also indicate a reduction for scores of all domains assessed, revealing a decrease in QoL in both groups, but with no difference between obese and non-obese subjects. In a study comparing QoL of 264 patients, Salaffi et al.[24] identified low scores in all domains of the SF-36 questionnaire in the OA group, a result similar to the present study.

In the study of Sutbeyaz et al.,[25] 28 patients with knee osteoarthritis and 28 healthy subjects were compared. The group with knee OA showed a significant decrease of QoL in all domains of the SF-36. In the present study, it was found that even non-obese subjects with OA also showed reduced scores in the SF-36 and difficulty in executing the activities evaluated in the WOMAC questionnaire. This decrease in QoL may be a consequence of the aging process *per se* and of joint and muscle changes due to OA, most often associated with local pain which, in turn, may compromise the ability to perform dynamic tasks and impacting negatively the QoL of this population.[26]

The control of factors associated with OA causing negative functional consequences, besides compromising QoL of this population, must be investigated. Obesity is one of the main risk factors and has been associated with functional decline, sedentary lifestyle, increase in secondary complications and cardiovascular risk. Coggon et al.[27] claim that prevention initiatives that are developed in public health programs for risk factors of obesity and its control may contribute to reducing the negative impact of osteo-articular diseases, especially knee OA.

Importantly, this study analyzed obesity using BMI, a measure of weight excess for a given height. BMI value is just a change in the energy balance of the individual; however, it does not allow that other factors, such as metabolic and inflammatory disorders and of lean/fat body mass composition, are taken into account.[21,22] It is possible that these not evaluated factors have a greater impact on functional capacity of obese seniors.

Our results should be analyzed with caution, due to the small number of participants and to the inability to evaluate patients immediately after their medical consultation, which could allow an analysis less influenced by pharmacological and/or non-pharmacological treatments. Another limitation of this study is associated with a failure to carry out an assessment of the level of understanding of the elderly surveyed with an appropriate instrument, or by a psychologist. Thus, it is possible that patients with low understanding and that provided inadequate responses to questionnaire items have participated in this study. In view of this, we suggest that further studies be carried out in order to obtain a better

understanding of the factors that influence the functional capacity and QOL of obese and non-obese elderly.

Conclusion

OA associated with obesity had a negative impact on the functional capacity of older people, who had a more intense pain and difficulty in performing everyday tasks. The elderly in both groups showed reduced QoL scores, with no difference in obese and non-obese.

Conflicts of interest

The authors declare no conflicts of interest.

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