**Analele Universităţii din Oradea**
**Facicula Educaţie Fizică şi Sport**
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. no. XXVI/**2016** pp.31 - 40
Article no. 26815 - 838

# STUDY REGARDING THE EFFICIENCY OF A PHYSIOTHERAPY PROGRAM IN PAIN REDUCTION, PHYSICAL FUNCTION AND QUALITY OF LIFE IMPROVEMENT IN PATIENTS WITH HIP OSTHEOARTHRITIS

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**Abstract:** ***Introduction.*** *Hip osteoarthritis is mainly characterized by articular cartilage lesisons (distrophy, erosions), lack of articular surfaces shape and contour due to femoral head distruction.****Aim.*** *This paperwork aims to emphasize the efficiency of a comprehensive rehabilitation program in functional and quality of life improvement and pain reduction, in patients with hip osteoarthritis.****Subjects****. This study was conducted in Clinical Rehabilitation Hospital from Baile Felix, on a group of 10 patiants with hip arthrosis, aged between 50 and 80 years old, 50% man, 50% woman, average weight &2 kg, IMC 25.6, duration of affection average 17 years, 50% retired from activity, 50% workers.****Metods.*** *As assessment tools were used: goniometry, 0-5 scale for muscular force and Womac index for pain and quality of life assessment. The exercise program aimed to increase hip muscle tonus and the increasing of hip jount mobility and stability due to a better crossing of femorla head in the acetabular cavity.****Results.*** *After following rehabilitation program, we found the reduction of pain (11±8.18 baseline versus 9±8.18 final), the improvement of hip joint moiblity (4.60±3.28 pretest versus 3.7±3.27 posttest), of physical functioning (43.20±26.75 pretest versus 40.30±26.42 posttest) and of quality of life (59.8±38.12 pretest versus 53±37.70 posttest).*
**Conclusions:** A rehabilitation program followed 5 times/ week, for two weeks, can lead to the improvement of hip joint mobility, to an increased muscular force of pelvic girdle and to the impovement of quality of life in patients with hip osteoarthritis.
**Key words:** osteoarthritis, quality of life, physical function, pain, hip mobility

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## INTRODUCTION

Hip arthrosis, known as a degenerative pathology of the hip, has a high prevalence especialy in women. (Alexandros Adrianakos, 2016). This pathology affects hip joint and adjacent muscles, leading to the development of structural and functional deficiencies, to pain, disability and a decreased quality of life. (Bennel, 2013)

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Hip joint fulfill complex functions in humans: body weight support, while allowing body displacement. When moving to bipedal position, this joint has readjusted anatomy and physiology of the robustness and mobility. Around the hip joint have been developed the most powerful muscle, in order to ensure perfect stability, content of bone surfaces and maintaining the vertical position of the body.

Hip joint is composed by two hip bone: hip bone (which together with the sacrum form the pelvis) and femur. They form the hip joint. The neck of the femur does not continue towards the femoral shaft. Thus, between the femoral neck and body, forms a normally open angle measured from 127 to 130 degrees. (Kapandji, 1987)

Any change in this angle changes the normal opening between the femoral head and acetabulum of the hip. When femoral angle is greater than 130 degrees, the femoral head will be moved up. This deformity is called coxa valga. When the angle decreases below 127 degrees, deformation is called coxa vara and the femoral head will look inward. Coxa valga and coxa vara are strains that can change radically hip joint mechanics, bringing a large amount of stress on the articular cartilage, favoring the development of osteoarthritis.

Two forces are acting on the hip joint: body weight and muscle strength.

In order to be minimal the stress on the hip joint, the two forces must be equal at this level, and also the weight and counterweight that balances the scales knife. (P. Varady, P. AUGAT, 2015)

Changing the angle of inclination of the femoral produces an imbalance of two forces, which will increase the load of the cartilage. Reorientation of the femoral head caused by the changes in inclination angle, decreases the bearing surface (supporting), substantially increasing the pressure on certain areas of articular cartilage.

Clinical observations and histological examinations have shown that the high and concentrated pressure in an area of the articular surface causes characteristic pathological changes specific to hip arthrosis.

The birth certificate of designation of osteoarthritis was initiated by two English authors, Colles (1839) and Redfern (1849), who described two concurrent processes opposing each other : osteochondral and resorption and bone neoformation. Today, the term osteoarthritis is well defined and published literature for the last 40 years, established precisely characters of this disease, although there are still gray areas, especially in terms of etiopatogenia and comparative value of various treatments applied. (Emil Mares, 2011)

Osteoarthritis is characterized mainly by articular cartilage lesions (dystrophy, erosion), loss of joint shape of the contour surfaces by flattening or smoothing femoral head bone structure, changes at the femoral neck and acetabulum (osteophytosis, osteosclerosis). It is associated with reshuffles bone deposition of abnormal bone at the periphery of the articular surfaces (osteophytes) and fibrosis (thickening) of joint capsule, with the decreasing of synovial fluid (fluid normally present in all synovial joints) which leads to decreased lubrication joint and thus to a higher coefficient of friction. Normally friction coefficient is 0.01 and its growth causes more wear. Side effects of these changes are: alterations in the femoral head and the acetabular cavity, articular cartilage destruction with direct impact on the two main functions of the hip: stability and mobility, accompanied by severe pain. (Hunter and Felson, 2006)

The causes of hip arthrosis varies from patient to patient due to the fact that many of them the etiology is not clear. Age is an important factor because it takes a considerable time for the tissues to weaken or to destroy the articular cartilage. Cartilaginous changes occurred in hip arthrosis are seen in areas of cartilage that supports the most commonly contracts due to their weight load. (Zhang Yuqing, and Joanne M. Jordan, 2016)

**SCOPE**

This paperwork aims to do a functional analysis of the hip joint in the context of primary hip arthrosis and to highlights the efficiency of a physiotherapy program well established after the assessment, on the improvement of joint function and in stagnation of hip disease, as much as possible.

**OBJECTIVES**

- An analysis of the functional status of the patient by: assessing hip biomechanics and pelvic girdle muscle strength.
- Pain behavior analysis (timing, intensity, hip function, walking, climbed down the stairs etc, walking distance) in relation to hip function.
- Establish a kinetic program effectiveness in relieving pain and improving hip function.

**HYPOTHESIS**

A physiotherapy program practiced five times a week for 2 weeks, can improve hip mobility, increases pelvic girdle muscles strength, and improve the quality of life in patients with primary osteoarthritis.

**MATERIALS AND METHODS**

The study was conducted at the Felix Medical Rehabilitation Hospital and at patient's home, on a total of 10 patients, diagnosed with primary hip osteoarthritis, aged between 50 and 80 years, mean age 64.6 years, 50% male, 50% women, highaverage 1.67 m, 72 kg average weight, average BMI 25.6, the average duration of the disease is 17 years, 50% of the subjects are retirees and 50% of them are workers.

*Functional Assessment*

An important aspect of the assessment is to identify mechanical adsverse conditions predisposing to the appearance of this pathology, as well as local and global factors causing adverse conditions. The decreasing of hip range of motion in all directions of movement (Arokoski et al 2004) and the decreasing of thigh muscle strength, particularly the quadriceps and hip abductorilor are crucial aspects of function disturbance in patients with hip osteoarthritis.

Hypotonia seems to occur due to reduction in diameter muscle rather than due to inhibition. (Loureiro et al 2013).

For joint mobility assessment (range of motion – ROM), the goniometer was used to determine the degrees of flexion, extension, abduction, adduction, internal rotation and external rotation of the hip.

Manual muscle testing was used for hip muscle strength evaluation. "Manual muscle testing is used to determine the clinical muscle strength on a scale known as the" 0-5 scale "(the National Foundation for Infantile Paralysis in the US). (Elena Sîrbu et al., 2012)

***Tabel nr.1 Manual muscle testing***

| Grade | Apreciation |
|---|---|
| F0 (absence) | No contraction |
| F1 (outlined) | Visible contraction, but no articular movement |
| F2 (mild) | Movement on all range of motion, but with no gravity |
| F3 (fair) | Movement on all range of motion against gravity |
| F4 (very good) | Movement on all range of motion with a moderate rezistance |
| F5 (normal) | Movement on all range of motion with a great resistance |

*WOMAC index*

WOMAC index was conceived in 1982 at the University of Western Ontario and McMaster. The index is available in over 65 languages and has been validated linguistically. WOMAC Index (Western Ontario and McMaster Universities Arthritis Index) is a set of standardized questions, often used by professionals to assess the status of patients with knee and hip pathologies. (Tubach F. et al., 2005)

WOMAC Index incude:

• **Pain assessment** (5 items): while walking, using the stairs at night in bed, sitting or lying down, wearing weights

• **Decreased mobility** (2 items) after the first half walk and later during the day

• **Joint function** (17 items): using ladders, lifting from sitting, standing, anterior trunk flexion, walking, up / down from the car, shopping, putting on/ getting out socks, lifting the bed, lying in bed, in / out of bathtub, sitting, laying, lifting the toilet, mild to difficult domestic occupations.

This score includes 24 parameters, the minimum score is 0 and the maximum score is 96.

Test questions are scored on a scale from 0-4, which correspond as follows: **no / no (0) // slightly (1) // moderate (2) severe // (3) // extreme (4).**

The scores for each subscale are summed, with a possible score between:

- 0 and 20 for pain,
- 0-8 for limiting the mobility
- 0-68 for physical function.

Usually the sum of the scores of three subscales gives a Womac score. The maximum score that can be achieved is 96. A higher score indicates Womac extreme pain, limiting mobility and severe major limitation of physical function. Weigl et al. (2003) conducted a study on the recovery of hip osteoarthritis and index used to assess functional Womac subjects. In this study were introduced a number of 23 parameters considered as the most frequent on the daily lives of assessed subjects.

*Physiotherapy management*

The intervention program consisted in exercises for strenghtening the hip internal rotators, adductors, hip joint extensor muscles (gluteus maximus posterior fibers of gluteus medius), hamstrings and quadriceps. Each patient was advised to follow the rules of hip arthrosis prevention.

## RESULTS

At the end of the rehabilitation program, posttest results showed that there is an improvement in the amplitude of ROM in all directions including the extension, adduction and internal rotation. (Table 2).

***Table nr. 2 Evolution of joint mobility (mean ± std.dev /10 subjects)***

| *Nr. crt* | *Movement* | *Pretest* | *Posttest* | *Improved ROM* | *Normal values* |
|---|---|---|---|---|---|
| ***1*** | Flexion, knee flexed | 91.2±52.8 | 95.7 ± 53.4 | 4.5 | 125 |
| ***2*** | Flexion, knee extended | 73±39 | 77.1±39.7 | 4.1 | 90 |
| ***3*** | Extension | 9.8±6.2 | 11.8±6.5 | 2 | 15 |
| ***4*** | Abduction | 36.5±24.7 | 41.9±25.1 | 4.8 | 60 |
| ***5*** | Adduction | 18.2±12.3 | 21.9±12.7 | 3.7 | 30 |
| ***6*** | External Rotation | 8.9±6.2 | 11.3±6.4 | 2.4 | 15 |
| ***7*** | Internal Rotation | 18.5±14.3 | 22±14.4 | 3.5 | 35 |

Table 2 showes that after the rehabilitation program applied during hospitalization at Rehabilitation Hospital of Felix was obtained increasing of joint mobility from 91 to 96 degrees hip flexion with the knee flexed, from 73 to 77 degrees for flexion of the knee extended from 10 to 12 degrees extension, 37 to 42 degrees of abduction, from 18 to 22 degrees for the adduction of 9 to 11 degrees external rotation and to 189-22 degrees internal rotation.

***Table nr. 3 WOMAC Scores (10 patients), mean ± std.dev.***

| *Nr. crt.* | *WOMAC* | *Pretest* | *Posttest* | *Val. minime* | *Val. maxime* |
|---|---|---|---|---|---|
| ***1*** | Pain | 11±8.18 | 9±8.18 | 0 | 20 |
| ***2*** | ROM decreasing | 4.60±3.28 | 3.7±3.27 | 0 | 8 |
| ***3*** | Physical activities | 43.20±26.75 | 40.30±26.42 | 0 | 64 |
| ***4*** | WOMAC score | 59.8±38.12 | 53±37.70 | 0 | 92 |

Chart no. 1 shows the comparison of pretest and posttest results for WOMAC subscore of pain. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 11. Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore, from 11 to 7.

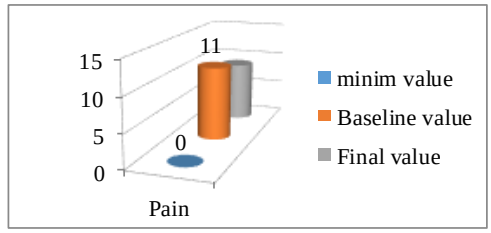


***Chart nr. 1 Comparison between baseline and final WOMAC scores for pain***

Chart no. 2 shows the comparison of pretest and posttest results for WOMAC subscore for range of motion. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 4.6. Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore 0.9 points, from 4.6 to 3.7.

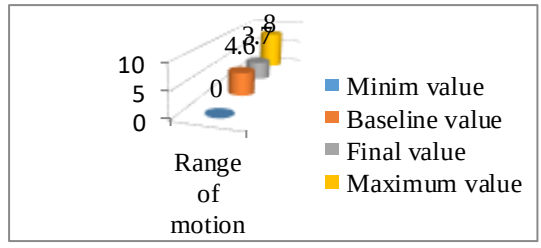


***Chart nr.2 Comparison between baseline and final WOMAC subscore for ROM***

Chart no. 3 shows the comparison of pretest and posttest results for WOMAC subscore physical activities. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 43.2.

Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore with 2.9 points, from 43.2 to 40.3.

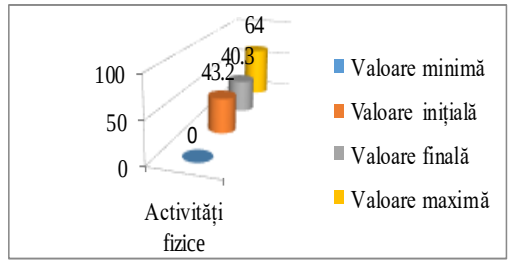


***Chart nr.3 Comparison between baseline and final WOMAC subscore for physical activities***

Chart no. 4 shows the comparison of pretest and posttest results for total WOMAC score. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 59.8. Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore with 6.8 poins, from 59.8 to 53.

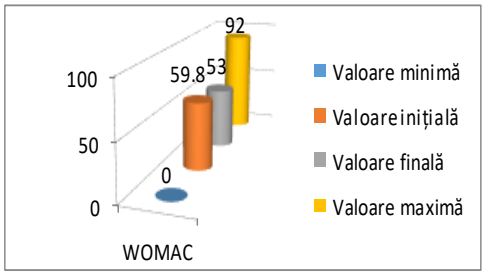


***Chart nr.4 Comparison between baseline and final total WOMAC score***

**DISCUSSIONS**

At baseline assessment, before the beginning of rehabilitation program, subjects showed a decreased ROM for: flexion, extenson, abduction, adduction, internal and external rotation and the hip has a posture in flexion, abduction, external rotation.

At baseline assessment, before the beginning of rehabilitation program, subjects showed a decreased muscle strength for flexors, extensors abductors, adductors, internal and external rotators of the hip.

After the rehabilitation program, final assessment showed an improvement of all parameters. Therefore we can say that the rehabiliation program was efficient for the improvement of: flexion with knee extended and also flexion with knee flexed, for extension, abduction, adduction, internal and external hip rotation.

Comparing the results with normal values of hip mobility, in the two situation, can be observed that at baseline, patients had a mean deficit of flexion with knee flexed of 33.8˚ and a great deficit of flexion with knee extended of 17˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 4.5˚ for hip flexion with knee flexed, from 91.2˚ to 95.7˚ and 4.1˚ for hip flexion with knee extended from 73˚ to 77.1˚. This improvement helps to the maintaining of a normal mobility of the hip joint, increase walking perimeter, subject can put his shoes on, can bent, dress and wash himself. We can say that the rehabilitation exercise program was efficient in both situation, for flexion with knee bent and extended and ROM is near to the normal value.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of extension of 5.2˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 2˚ for hip extension from 9.8˚ to 11.8˚.

Because this pathology tend to modify the anatomical position of lower limb in flexion, this improvement with 2˚ of extension helps to a better fixation of femoral head in acetabulum.

We can say that the rehabilitation program was efficient for the improvement of hip extension.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of abduction of 23.5˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 4.8˚ for hip abduction, from 36.5˚ to 41.3˚. This improvement with 4.8˚ of abduction help to the maintaining of normal hip ROM.

We can say that the rehabilitation program was efficient for the improvement of hip abduction.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of adduciton of 11.8˚. After the rehabilitation program for

primary hip arthrosis patients showed an improvement with 3.7˚ for hip adduction from 18.2˚ to 21.9˚. Because this pathology tends to change the anatomical position of lower limb in abduction, this improvement with 3.7˚ of adducție help to a better fixation of femoral head acetabulum, to a better hip ROM and the movements need less effort. We can say that the rehabilitation program was efficient for the improvement of hip adduction.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of internal rotation de 6.1˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 2.4˚ for hip internal rotation, from 8.9˚ to 11.3˚. Because this pathology tend to change the anatomical position of lower limb in abduction, this improvement with 2.4˚ of internal rotation, help to a better fixation of femoral head acetabulum. We can say that the rehabilitation program was efficient for the improvement of hip internal rotation.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of external rotation of 16.5˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 3.5˚ for hip external rotation from 18.5˚ to 22˚. This improvement with 3.5˚ help to a better ip ROM, the movement is near to normal amplitude. We can say that the rehabilitation program was efficient for the improvement of hip external rotation. After final assessment, at the end of the rehabilitation program, can be observed an encreasing in muscle strength for all movements, meaning that the rehabiliattion program in efficient for the improvement of hip stability.

If, at the beginnig, 60% of the subjects had F3 muscle strength, 20 % had F4 and 20% had F4+ muscle force, after the rehabilitation program for primary hip arthrosis, flexor muscle srength increased from F3 to F4+ in 60 % of the subjects, from F4- to F4+ in 20 % of the subjects and a stagnation of flexor muscle strenght in 20 % of the subjects. This encreasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint. We can say that the exercise rehabilitation program was efficient for the encreasing in hip flexor muscle strength.

If, at the beginnig, 20% of the subjects had F3 muscle strength, 20 % had F3+ and 60% had F4- muscle force, after the rehabilitation program for primary hip arthrosis, extensor muscle srength increased from F3 to F4+ in 20 % of the subjects, from F3+ to F4+ in 20 % of the subjects and from F4- to F4+ in 60 % from subjects, for flexor muscle. Because in this pathology, extensor muscles are weaker than hip flexor muscle, this increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip extensor muscle strength.

If, at the beginnig 40 % of the subjects had F3 muscle strength and 60 % had F3+, after the rehabilitation program for primary hip arthrosis, abductors muscle strength increased from F3 to F4+ in 40 % of the subjects and from F3+ to F4+ in 60 % of the subjects. Because in this pathology, abductor muscles are weaker than hip abductoare muscle, this increasing of muscle

strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip abductor muscle strength.

If, at the beginnig 60 % of the subjects had F3 muscle strength and 40 % had F3 after the rehabilitation program for primary hip arthrosis, abductors muscle strength increased from F3 to F4+ in 60 % of the subjects and from F3+ to F4+ in 40 % of the subjects. This increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of

hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip adductor muscle strength.

If, at the beginnig 60 % of the subjects had F3 muscle strength and 40 % had F3+, after the rehabilitation program for primary hip arthrosis, internal rotator muscle strength increased from F3 to F4+ in 60 % of the subjects and from F3+ to F4+ in 40 % of the subjects. Because in this pathology, internal rotator muscles are weaker than hip external rotator muscle, this increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip internal rotator muscle strength.

If, at the beginnig 60 % of the subjects had F3 muscle strength and 40 % had F3+, after the rehabilitation program for primary hip arthrosis, external rotator muscle strength increased from F3 to F4+ in 60 % of the subjects and from F3+ to F4+ in 40 % of the subjects. This increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip external rotator muscle strength.

Baseline results of Womac score, showed that the patients complained about pain in hip joint area, a stifness of hip joint as well as dificulties in doing daily activities. Comparing the results from pain assessment with minimal and maximat subscale scores, at the baseline, patients had a mean subscore of 11, meaning a significant pain, leaidng to the limitation of daily activities.

After rehabilitation program baseline pain subscale score decreased from 11 to 6, meaning a moderate pain. We can say that the exercise rehabilitation program was efficient for the decreasing of pain in hip joint area.

Gabriela Hernández-Molina and colab (2008), conducted a metaanalisys regarding the efficiency of different modalities of terapeutical intervention in patients with hip join arthrosis.

The results of this study emphasized that therapeutic exercises are more efficient than medication therapy, but these studies presented a moderate to great heterogenosity. Even more, after the exclusion of the studies who were the source of this heterogenosity, results became even more favourable for exercise rehabilitation programes.

Comparing the baseline and final results of WOMAC subscore for the decreasing of ROM, at the beginning patients had a mean subscore of 4.6. After the rehabilitation program for primary hip arthrosis, subscore decreased with 0.9 points, from 4.6 to 3.7. This means that hip joint stiffness decreased and there was an improvement of hip joint mobility. We can say that the exercise rehabilitation program was efficient for the increasing in hip join range of motion.

Comparing the baseline and final results of WOMAC subscore for physical activities, at the beginning patients had a mean subscore of 43.2, meaning that the subjects presented some dificulties in doing activities like going up and down stairs, rising from a chair, prolonged standing, anterior trunk bending, walking, getting in and out of the car, going for shoping, puting in/ taking off socks, getting out of the bed, bathtub, getting out from the toilet, different home chores. After rehabilitation program for hip arthrosys, meas score of this subscale decreased with 2.9 points, from 43.2 to 40.3. This means that the patients does not have great dificulties in doing activities of daily living. We can say that the exercise rehabilitation program was efficient for the improvement of physical activities area.

Comparing the baseline and final results of total WOMAC score, at the baseline patients presented a total mean score of 59.8 points. After rehabilitation program for hip arthrosys, meas score decreased with 6.8 points, from 59.8 to 53 point. This decreasing means that the subject's pain decreases, is a mild pain, hip joint improved mobility, there is no rigidity and subjects can do their activities of daily living more easily. We can say that the exercise rehabilitation program was efficient for the improvement of subject's quality of life.

Weigl and colab. (2003), conducted a study on 128 subjects, regarding the hip joint rehabilitation and they used WOMAC Index for functional assessment of the subjects. They assessed the evolution of pain, physical function, other aspects of healt, after following a rehabilitation program. The conclusion of this study was that following a comprehensive rehabilitation program for hip joint arthrosis can lead to a reduction in pain intensity and to an improvement of hip function on long term.

## CONCLUSIONS

After rehabilitation program, all ROM parameters assessed had improved; we can say that the rehabilitation program was efficient for the improvement of: hip flexion with straight knee and hip flexion with knee bend, extension, abduction, adduction, internal and external rotation.

After rehabilitation program Womac subscores and total scores improved; we can say that the rehabilitation program was efficient for the reduction of pain, hip range of motion, for the improvement of activities of daily living and also for the increasing of patients quality of life.

An exercise rehabilitation program followed 5 times/ week, for two weeks, improve hip joint mobility, pelvic girlde muscle strength and the quality of life in patients with hip arthrosis.

## LIMITATIONS OF STUDY

**None.**

## CONFLICT OF INTERESTS

**None.**

## ACKNOLWDGEMENTS

**None.**

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| Submitted: | Revised: | Accepted and published online |
|---|---|---|
| June 16 , 2016 | November 08, 2016 | December 22, 2016 |