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VIZDOAGĂ ANATOLIE

**MEDICAL REHABILITATION OF PATIENTS WITH KNEE
OSTEOARTHRITIS IN RELATION TO THEIR FUNCTIONAL
DISABILITY**

332.01 - MEDICAL REHABILITATION AND PHYSICAL MEDICINE

Summary of Ph.D. Thesis in Medical Sciences

Osteoarthrosis osteoarthritis

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The PhD thesis was developed at the Department of Medical Rehabilitation, Physical Medicine, and Manual Therapy, within PI Nicolae Testemitanu State University of Medicine and Pharmacy of the Republic of Moldova.

Scientific advisor:

Pascal Oleg, Dr. med. habil., Univ.Prof. *signature*

The Guiding Committee Members:

Mazur Minodora, Dr. med. habil., Univ.Prof. *signature*

Şalaru Virginia, Dr. med. habil., Assoc.Prof. *signature*

Alisa Tăbîrţă, MD., Assoc.Prof. *signature*

Ph.D. thesis defence will take place on 22.12.2021, 14:00 o'clock within the Nicolae Testemitanu SUMPh , on Ştefan cel Mare şi Sfânt 165 bd., office 165 , at the meeting of the Commission for Public Defence of PhD thesis, approved by the decision of the Academic Consortium Board from 06.07.2021 (*minutes no .21*).

Members of the Commission for public defence of the doctoral thesis:

Supervisor:

Cobeţ Valeriu, Dr. med. habil., Univ.Prof. *signature*

Members:

Pascal Oleg, Dr. med. habil., Univ.Prof. *signature*

Stamati Adela, MD., Assoc.Prof. *signature*

Moşneaga Marigula, MD., Assoc.Prof. *signature*

Official Representatives:

Croitor Gheorghe, Dr. med. habil., Assoc.Prof. *signature*

Mazur Minodora, Dr. med. habil., Univ. Prof. *signature*

Vetrilă Viorel, MD., Assoc.Prof. *signature*

Author

Vîzdoagă Anatolie *signature*

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THE RESEARCH CONCEPTUAL FRAMEWORK

The actuality of the research.

Osteoarthritis (OA) is the most common musculoskeletal condition for its high prevalence rate, being characterized by typical signs and a relevant functional impairment, ultimately resulting in a reduction in quality of life [1]. The knee is the most frequent site of osteoarthritis, whereas according to world estimates, 630 million people suffer from osteoarthritis, which is 10-12% of the world's population, while more than 80% of people over 55 years old show changes in the radiographic findings of osteoarthritis [2]. The statistical data from the Republic of Moldova in 2018 showed an incidence of 46.900 cases, and 47.900 cases in 2019, which represents a slight increase in morbidity rate due to musculoskeletal system disorders and namely osteoarthritis [3]. The area of research into osteoarthritis, as a major non-communicable disease, remains a priority for WHO and global public health programs.

Generally, osteoarthritis progresses slowly and is characterized by nonspecific local symptoms such as pain, stiffness, joint cracking, loss of mobility and joint function that affect quality of life [4]. It should be noted that, on the one hand, the disease is common and not difficult to diagnose, on the other hand, the progressive and irreversible nature of the disease might be challenging for effective treatment. Osteoarthritis management includes a variety of many non-drug options and pharmacological interventions. The treatment should be patient-customized involving a combination of approaches [5, 6]. Although, they relieve the symptoms, no effects on disease progression have been proven. Non-drug treatment includes regular exercise, educational measures, body weight loss, wearing supportive and mobility devices [7, 8]. However, further research is needed to identify the types of medical rehabilitation programs that are most effective in patients with knee OA.

The purpose of the study was to determine the effectiveness of a combined medical rehabilitation program (and manual therapy), depending on the functional disability in patients with osteoarthritis of the knee, to optimize patient behaviour and improve their quality of life.

The objectives of the study:

1. To detail the clinical and functional manifestations and changes in joint biomechanics in patients with osteoarthritis of the knee joint.
2. To assess the degree of functional impairment of the joints by clinical tools in patients with osteoarthritis of the knee.
3. To evaluate the effectiveness of the combined rehabilitation program on joint functionality and pain intensity.

4. To assess the impact of the combined medical rehabilitation program on quality of life in patients with knee osteoarthritis.

Research methodology:

The paper analysed the study results from a theoretical and scientific perspective in accordance with the purpose and objectives formulated within the research. The present study was based on the clinical examination via the assessment of painful and swollen joints, somatoscopy, somatometry, goniometry, anthropometry and registration of inflammatory markers, imaging techniques and modern clinical tools, followed by statistical procedures. To solve the outlined tasks, an analytical study was conducted on 164 consecutive patients diagnosed with knee OA according to the ACR criteria of Altman R., in 1991, which met our inclusion criteria. Patients were randomly divided into 2 groups: group I - the control group, which included 82 patients with knee OA, rehabilitated by the conventional program and group II - the research group of 82 patients who underwent a combined treatment, the conventional program and specific manual therapy techniques. Patients in both groups were evaluated at the end of the treatment program (T1) and over 30 days (T2). The collected material was analysed using Microsoft Excel and MedCalc programs.

Novelty and originality of the research. The present analytical study evaluated the effectiveness of the medical rehabilitation program combined with specific manual therapy techniques in patients with knee osteoarthritis. The research results supported the choice of medical rehabilitation methods and means, identified the optimal combinations of medical rehabilitation programs in patients with knee osteoarthritis, depending on the level of functional disability, as well as confirmed the feasibility of specific manual therapy techniques for restoring joint functionality.

The important scientific issue solved in the PhD thesis. The study assessed the effectiveness of the manual therapy combined with the conventional medical rehabilitation by developing a scheme for an integrated approach to the patient with OA treated by the rehabilitation physician.

The theoretical significance of the research. The study contributed to forming a new vision on an integrated approach to medical rehabilitation of patients with OA in Moldova, by highlighting the clinical and evolutionary features of the disease and changing joint biomechanics found in OA as being a chronic and progressive disease.

The applicative value of the research. The study results have supported the feasibility of using the means of complex medical rehabilitation in combination with manual therapy in the

management of patients with OA. The results of scientific research have allowed implementing a comprehensive rehabilitation program for functional disability in patients with knee OA, aimed at maintaining joint functionality and improving the patient's quality of life.

Implementation of the research results. The research findings were introduced into the educational process at the Department of Medical Rehabilitation and Physical Medicine and in the daily practice of the University Centre of Medical Rehabilitation at Nicolae Testemitanu SUMPh.

Validation of the scientific results. The research results were reported at national and international forums; at international congresses: 36th Balkan Medicine Week; 20th National Congress of Rheumatology, Bucharest, Romania; 12th Conference "Ortho posturognosis - Knowledge for Impact and Disease Control, 2019; the International Scientific Congress "Sport. Olympism. Health", 2017; at national forums: Scientific and practical conference on "The Days of Nicolae Testemitanu State University of Medicine and Pharmacy"; Conference of the Society of Internists from the Republic of Moldova; National Scientific and Practical Conference with international participation: "Medical rehabilitation and sports medicine", 2016.

The research was planned and carried out within the Department of medical rehabilitation, physical medicine, physiotherapy and manual therapy on the clinical basis of the University Centre for Medical Rehabilitation. The positive opinion of the Research Ethics Committee of Nicolae Testemitanu SUMPh No. 61 dated 03/14/2017 was received for the research. The PhD thesis was discussed, approved and recommended for defence at the meeting of the Department of Medical Rehabilitation, Physical Medicine, Manual Therapy, PI Nicolae Testemitanu State University of Medicine and Pharmacy of the Republic of Moldova (minutes No. 24 of 24.05.2021) and the Scientific Seminar 321.04 (minutes No. 1 of 30.06.2021).

Publications on the thesis topic. The research materials were reflected in 25 scientific publications, including 1 monograph, 3 articles, of which 2 in peer-reviewed journals, 1 in impact factor journal; posters and papers at 6 national and 8 international scientific conferences.

Keywords: knee osteoarthritis, medical rehabilitation, clinical and functional tools, quality of life, disability, physiological treatment, physiotherapy, manual therapy techniques.

Thesis summary. The research paper is presented on 125 pages of electronic text and includes an introduction, a literature review, 4 chapters, conclusions and practical recommendations, bibliography with 122 literary resources. The thesis includes 19 tables, 27 figures, 7 annexes. The obtained results were presented in 25 scientific publications and 2 certificates of innovator.

THESIS CONTENT. INTRODUCTION.

The Introduction describes the actuality and the importance of the studied problem, the purpose and objectives of the research, the scientific novelty of the obtained results, the theoretical importance and the applicative value of the paper, validation of the research results and the summary of the whole thesis.

1. CLINICAL STATUS, QUALITY OF LIFE AND REHABILITATION OF THE PATIENT WITH KNEE OSTEOARTHRITIS (*literature review*)

This chapter contains the summary of the relevant literature data on the impact of osteoarthritis on the functionality of the knee joint. The study described the main arthritic lesions in relation to joint biomechanics, by analysing the factors that determined the onset, progression and severity of the disease. The major principles of OA patient behaviour were also considered. Although OA is the most common joint condition, yet, there is no etiopathogenetic treatment and a unique concept regarding the management of this disease. It should be noted that the present research included the assessment of clinical and paraclinical features of the disease, of the therapeutic effects of various drugs, of the joint functions and the degree of disability caused by OA, as well as the role of various rehabilitation programs in patients with knee OA. However, it was difficult to evaluate the practical recommendations in developing a modern concept of physical and kinetic rehabilitation of the joint affected by OA, which is a progressive chronic disease that affects the patient's overall health. According to recent studies, the role of rehabilitation programs in reducing the rate of disease progression, maintaining musculoskeletal functionality and, thus, improving the quality of life has been recognized. At the same time, patients with OA, which is commonly associated with pain, report lack of routine exercise, as well as low levels of physical activities. In-depth studies using tools to quantify the effect of medical rehabilitation programs according to the degree of functional disability were not identified in the studied literature. Particular attention was paid to recent publications, sustaining the logic of the relevance and the practical necessity of the study.

2. RESEARCH MATERIALS AND METHODS

2.1. Clinical and normative characteristics of the study group

The proposed research was carried out at the Department of Medical Rehabilitation, Physical Medicine and Manual Therapy, Faculty of Medicine No. 2 of IP Nicolae Testemitanu State University of Medicine and Pharmacy from the Republic of Moldova (Emil Ceban – rector,

university professor, Dr. Med. Habil.); at the clinical base of the University Center for Medical Rehabilitation (Pascal Oleg – chairman, Univ. Prof, Dr. Med. Habil).

The study sampling was selected among patients with varying degrees of osteoarthritis of the knee joint, diagnosed according to the criteria of Altman R., 1991 [9] and recommended by ACR, which included the following: patients aged over 50, knee pain and morning stiffness up to 30 minutes, mobile cracking and osteophytes determined by X-ray. The research complied with and considered the principles of medical ethics and deontology by stating the inclusion and exclusion criteria for this study, and the patients voluntarily signed the informed consent for the clinical trials.

The inclusion criteria:

1. Knee osteoarthritis that fulfils the ACR criteria, radiological grade II-III according to Kellgren-Lawrence classification.
2. The patient aged between 18 and 65 years old.
3. Patients with health insurance.
4. Agreement not to modify the drug treatment for OA during the study.
5. Ability to understand and voluntarily sign the informed consent.

The exclusion criteria:

1. Patient refusal.
2. Patients with contraindications for physical and / or manual therapy.
3. The use of rehabilitation treatment within the last 3 months prior to inclusion in the study.
4. Concomitant joint pathology (including reactive synovitis or Baker's cyst).
5. Decompensated comorbidity.

To conduct the study and achieve the set objectives, a group of 164 patients with OA of the knee joint was selected, who underwent complex medical rehabilitation programs for the treatment of osteoarthritis of the knee joint for 10 days. The sample size was calculated using the formula for randomized trials. A representative sample of the studied subjects is assessed according to the following formula:

$$n = \frac{1}{(1-f)} \times \frac{2(Z_{\alpha} + Z_{\beta})^2 x P(1-P)}{(P_o - P_1)^2}$$

whereas:

P_0 = proportion of successful rehabilitation of patients with knee OA using traditional physio-kinotherapy methods is 28.0%. ($P_0=0.28$).

P_1 = it has been assumed that the successful complex medical rehabilitation (physiotherapy and kinotherapy and specific PNF techniques) of patients with knee OA, will make up 56.0% ($P_1=0.56$).

$$P = (P_0 + P_1)/2=0.42$$

Z_α – table value. When „ α ” – the significance threshold is 5%, then coefficient $Z_\alpha = 1.96$

Z_β – table value. When „ β ” – the statistical power of the bilateral comparison is 10.0%, then coefficient $Z_\beta = 1.28$

f = proportion of patients who are likely to leave research for various reasons $q = 1/(1-f)$, $f=10,0\%$ (0,1).

By entering the data into the resulting formula, we obtained:

$$n = 1/(1-0.1) \times [(2(1.96+1,28)^2 \times 0.42 \times (1-0,42)] / (0.28-0.56)^2 = 1.11 \times 5.1131/0.0784 = 82,39 = 82$$

Women (127) with a ratio of 3:4 dominated the study group. The data included patients aged between 42 and 84 years, the mean age being of 62.2 ± 8.76 years. The age of the disease onset ranged from 40 to 75 years (the mean age - 54.8 ± 8.42 years), yet the disease occurred more often in patients over 50. Subsequently, patients were randomly divided by random distribution of sealed opaque envelopes. To avoid influencing the distribution, the envelopes were prepared and sealed by the head of the department, then stored at the registry of the University Rehabilitation Centre. After checking the inclusion and exclusion criteria of the research, followed by signed informed consent, the allocation was performed by the person in charge of the centre's registry. Thus, 164 consecutive patients, who met the research criteria, were divided into 2 groups: group I – the control group, including 82 patients with knee OA, rehabilitated by conventional therapy and group II - study group with 82 patients, who underwent a combined treatment of a conventional program and specific manual therapy techniques.

2.2. General and specific methods of examination of the investigated patients

The selected group was assessed according to the study design (figure 1) by using general and specific methods. The general examination included the patient survey, general clinical examination and assessment of painful and swollen joints, anthropometry, measurement of the Body Mass Index (BMI) and recording of the inflammatory markers viz. erythrocyte sedimentation rate (ESR) and C-reactive protein. The quantitative joint assessment involved in the pathological process, issued by the American College of Rheumatology (ACR), reported the tender joint count

(TJC) and swollen joint count (SJC), likely to range between 0 - 78/0 - 76. Knee joint examination included inspection at rest and during movements, palpation and assessment of joint mobility, as well as performing the so-called knee shock maneuvers etc. Skin or subcutaneous changes were grouped according to discoloration, local hyperthermia, and nodules (Bouchard and Heberden).

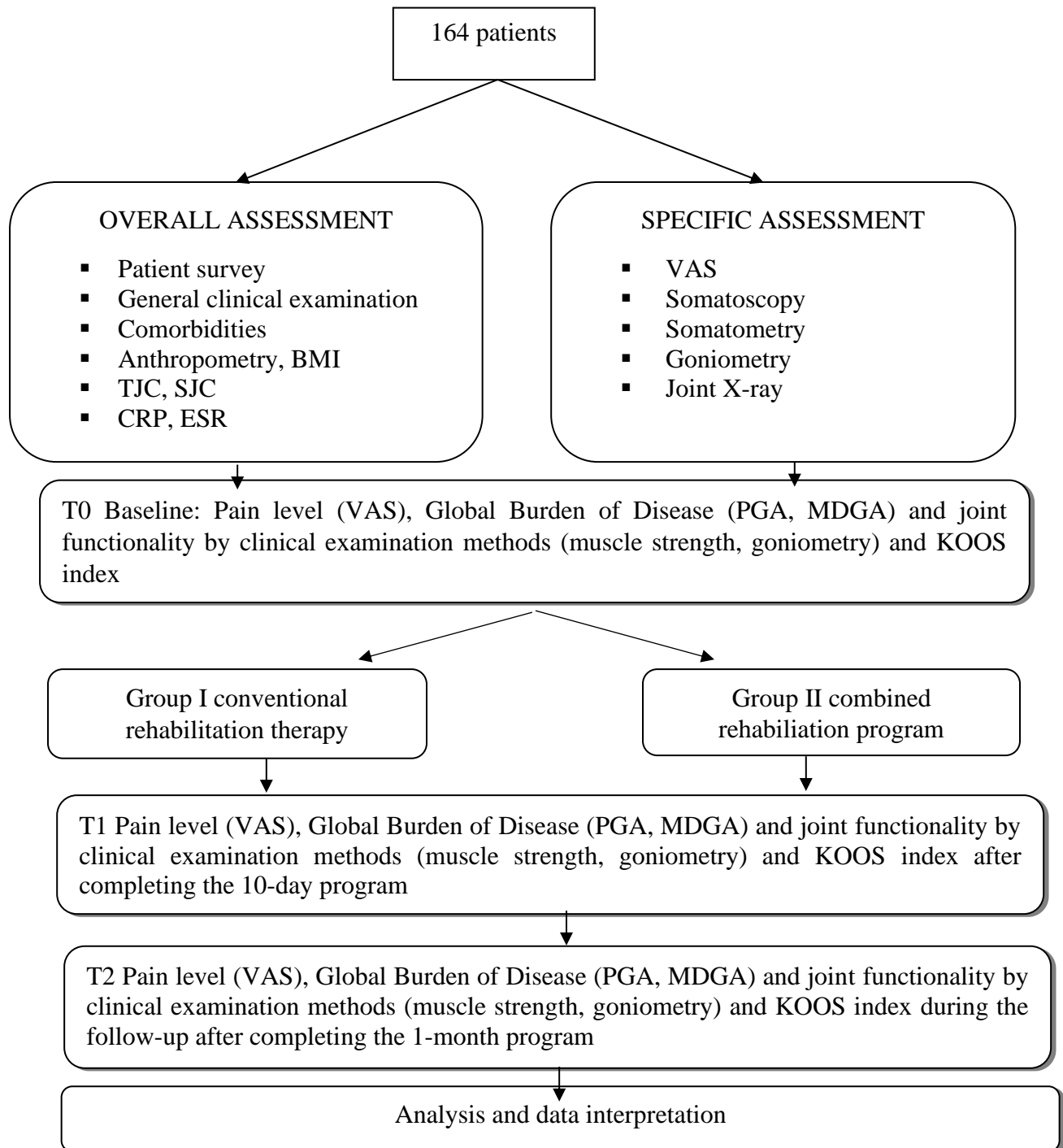


Figure 1. The study design

We also examined the presence of both joint and periarticular joint swelling, joint deformities, sensitivity to palpation and joint mobility. Palpation was also used to determine pain

in the lateral and medial region in patient's supine positioning and in partial flexion of the knee, as well as the condition of the quadriceps muscle. Joint and / or tendon crackles were reported during active and passive movement, while assessing joint stability and functionality. To obtain study results and assess the knee range of motion, an optical goniometer was used to measure the joint angles. The joint assessment included the examination of both knee and hip joints, being performed in all mobilization positions and measured in degrees. Active and passive knee flexion, extension, internal and external rotation were measured. The assessment of muscle strength was performed by grading on a 0 to 5 scale [10.]. The diameter of the thigh and leg, as an indicator of muscle development or hypotrophy, was determined by somatoscopy and somatometry, namely by measuring circular and transverse dimensions, as well as by palpation, using a tape measure or an anthropometric compass relative to the healthy contralateral segment. The specific examination included the radiological recording of the disease stage, graded according to the reference form 027 of Kellgren-Lawrence (K-L) grading system [11].

To perform a comprehensive examination of the OA manifestations in 164 patients under study, modern tools for assessing knee osteoarthritis approved by OMERACT - OARSI (Outcome Measures in Rheumatoid Arthritis Clinical Trial - Osteoarthritis Research Society International) were used [12]. Thus, the research areas included the overall patient condition, joint functionality, the patient's quality of life and the impact on the psychosocial state of the patient. Patient health problems were assessed using a global rating scale. Similar to pain, the patient's overall level of disease was assessed using the Patient Global Assessment (PGA) and a physician and / or Medical Global Assessment (MDGA). The results were evaluated using the VAS scale. KOOS (Knee injury and Osteoarthritis Outcome Score) assesses the patient's opinion on the knee condition and its related problems, whereas a decrease in values below 50% in any of the areas means a certain degree of disability [13,14].

2.3. Therapeutic programs applied

The general plan for the rehabilitation treatment of gonarthrosis was focused on:

1. Reducing pain.
2. Restoring passive and active stability.
3. Restoring joint mobility.
4. Compliance with the rules of secondary prevention.

Based on the general treatment plan, which follows the general principles of physiotherapy of the knee joint for gonarthrosis, we individualized the patient recovery programs in accordance with the specified parameters.

The conventional therapeutic program focused on:

1. Restoring the quadriceps muscle tone as a knee extensor and "latch" that was achieved via isometric and progressive resistance exercises.
2. Restoring the quadriceps muscle strength in the area of critical stability between 60 ° - 90 ° flexion, by increasing strength and endurance.
3. Toning of the hamstrings performed to the 15 ° - 20 ° end-range extension of the unstable knee: isometric exercises, resistance exercises.
4. Training the fascia lata and the calf muscle tensor.

Another important goal besides joint stability and strength is the parallel recovery of the knee joint mobility to functional limits. The following procedures were used:

- postures to reduce knee flexion;
- weights were applied on the knee, while sitting on a chair and stretching the leg to the other chair;
- independent passive and active exercises with their own bodyweight workouts and weights.

Patients from both groups underwent 10 electrotherapy sessions, with dynamic currents in the knee joint, a negative electrode (cathode) being applied to the pain area with a biphasic current for 4 minutes, then a modulated current with a short period of 3 minutes and a continuously modulated current for 3 minutes. Electrotherapy was performed with a multifunctional device for physiotherapeutic procedures "Refton" -01-FLS.

The complex program included techniques of the conventional therapeutic program and adapted manual techniques, aimed at increasing the functional barrier of tissues for gaining the "joint play" of the knee.

1. Post-isometric relaxation of the quadriceps muscle.
2. Post-isometric relaxation of the triceps surae muscle.
3. Post-isometric relaxation of the muscles of the posterior thigh (biceps femoris, semitendinosus, and semimembranosus muscles).
4. Ischemic compression (myotherapy) of the trigger points of the quadriceps, biceps femoris, semitendinosus, and semimebranos muscles.
5. Joint mobilization.
 - a) Anteroposterior knee joint mobilization.
 - b) Lateral joint mobilization.
 - c) Medial joint mobilization.
 - d) Rhythmic joint mobilization by traction.

- e) Rhythmic joint mobilization by rotation.
- f) Knee joint mobilization. Dorsal decubitus IP.

The complex rehabilitation program includes 10 individual workout sessions, 30 minutes each; the intensity and number of exercises were selected individually for each patient depending on their physiological strength and clinical status. The entire medical rehabilitation program was unified and aimed at achieving both the proposed objectives and overall goal of rehabilitation.

After 10 days (T1) of the rehabilitation completion, the patients from both groups were re-assessed with clinical instruments to determine the somatometry and goniometry indices. Patients were instructed to continue physical therapy exercises individually at home, by respecting the duration and intensity, then being invited for a follow-up visit 1 month after the completion of the medical rehabilitation program. The patients underwent clinical, functional and goniometric assessment of the knee joint, as well as a patients' survey to identify their adherence to the recommended physical therapy program.

2.4. Methods for Statistical Data Analysis

The statistical data processing was performed via Microsoft Excel and MedCalc. The analysis highlighted the structure and dynamics of the phenomena under study, by using analytical statistical methods, considering the arithmetic means and their errors. The comparison of statistical significance criteria allowed determining the differences between the mean and percentage values. The correlation between continuous variables was carried out by determining the Pearson and / or Spearman correlation coefficients. To estimate the degree of dependence of variance of the variables, the coefficient R² was determined.

3. ESTIMATION OF CLINICAL AND FUNCTIONAL DEFICIENCIES IN EXAMINED PATIENTS

3.1. Clinical and functional features of knee osteoarthritis in the study groups

The presents study was conducted on 164 patients diagnosed with knee OA, the group consisting mainly of 127 women (77.4%). The mean age of the patients was 62.2 ± 8.7 years, ranging from 42 to 84 years, while the mean duration of the disease in the study group was 7.0 ± 4.9 years, which relates to the epidemiological features of the disease. Thus, in most patients the disease started after the age of 50. The study included all consecutive knee OA patients admitted to the University Medical Rehabilitation Centre for treatment and who presented all inclusion criteria, while no exclusion criteria were identified.

In compliance with 1991 R. Altman diagnostic criteria, 150 (91.5%) of the patients were found to be over 50 years old, 164 (100%) patients reported pain in the knee joint, being a reason to visit

the doctor, and 161 (98.2%) cases were associated with joint cracking while moving. Based on the detailed collection of pathological signs, 123 (75%) patients reported short-term morning stiffness, lasting up to 30 minutes. On physical examination of the knee joint associated with cracking, 57 (34.75%) cases revealed joint swelling and X-ray imaging confirmed the presence of osteophytes in 128 (78%) of the assessed cases.

When examining the knee joints, deformities in the genu flexum (136 - 82.9%), genu varum (4 - 2.4%) and genu valgum (24 - 14.6%) were also revealed, being a risk factor for the onset of the disease, as well as its consequences. Various degrees of joint malformation were found in both groups, which did not correlate with the degree of joint swelling or the duration of the disease ($r = 0.29$).

Knee joint pain was reported by all patients and was associated with hip and hand joint pain in 32 of the cases (about 20%), in 16 cases (about 10%) impairment of the spine was reported and about 10% of patients (16 cases) experienced pain in other joints (shoulders, elbows, and talocrural joints). Unilateral knee involvement was found in only 13 (7.9%) of patients, whereas bilateral involvement - in 151 (92.1%), which confirms the systemic features of the disease.

The assessment of joint mobility showed a significant reduction in the active knee flexion with the extended hip in both limbs with mean values of $88.6 \pm 8.7^\circ$ for the right knee, and $92.4 \pm 10.2^\circ$ for the left one, showing significant differences between limbs ($p < 0.01$), possibly due to the fact that most patients reported the right leg as the weight-bearing one. Active knee flexion with bent hip was on average $97.0 \pm 7.8^\circ$ for the right limb, and $101.9 \pm 10.7^\circ$ for the left ($p < 0.01$). Passive flexion reached an amplitude of $103.0 \pm 10.7^\circ$ and 107.1 ± 12.9 degrees for the right and left knees, respectively. Active extension of the right knee was significantly higher than that of the left knee (right $7.3 \pm 3.2^\circ$, left 4.2 ± 3.6 degrees, $p < 0.01$). Functional range of motion is required for typical daily activities; most of these functions require 120-degree knee flexion and full knee extension. According to the data obtained from the initial assessment, it was found that the patients were unable to function normally, resulting in varying degrees of disability. For the subsequent analysis of functional disability, the KOOS grading scale was used. In terms of daily physical and sports, moderate disability was associated with values of 30-50%, and pronounced disability for a score below 30%. When comparing the goniometric parameters between the groups, similar reductions in active and passive flexion and a pathological increase in joint extension were revealed, the differences were insignificant in the control group compared with the study group.

Somatometric data of the knee joint involve mid-patellar circumference (MPC) measurement at both knees, expressed in centimetres. The data obtained for the entire group

showed values of the mid-patellar circumference at the right leg of 44.4 ± 2.7 cm, and at the left - 44.3 ± 2.8 cm ($p > 0.05$). The thigh circumference (TC) in the suprapatellar area was 50.8 ± 3.7 cm for the right thigh, and 50.7 ± 3.7 cm for the left thigh in the entire study group ($p > 0.05$). The thigh circumference in the subpatellar area was 41.9 ± 2.8 cm and 41.8 ± 2.6 cm ($p > 0.05$) for the right and left leg, respectively. Suprapatellar TC is an important marker of muscle hypotrophy and a good determinant of pain and disability ($p < 0.05$), but no significant association with the disease severity has been determined between radiological changes and disease severity. Changes in muscle tone of the quadriceps femoris on a scale of 0 to 3 were assessed, where 0 is no hypotonia and 3 is the highest level of hypotonia. This fact was confirmed by measuring the muscle tone of the quadriceps in patients under study, whereas the right leg was more affected than the left one ($p < 0.01$), being related to the decrease in joint flexion movements.

Thus, the analysis of somatoscopic and somatodynamic indices of the knee joints of patients under study showed a decrease in joint functionality by a reduced flexion and hyperextension, affecting the tone of the quadriceps and hamstring muscles.

3.2. Assessment of paraclinical parameters (imaging and laboratory indices)

To assess the systemic inflammatory process in patients from the study group, non-specific inflammatory markers, such as PCR and ESR, were analysed. Based on the data obtained, it was found that the inflammatory markers were within the normal range for the entire study group, however deviations in the erythrocyte sedimentation rate were observed both in 42 (51.2%) patients from group I and in 49 (59.7%) patients from group II, as well for C-reactive protein- in 35 (42.7%) patients from group I and 46 (56.1%) patients from group II. Based on the study inclusion criteria, only patients diagnosed with OA according to the ACR criteria and with a radiological stage II-III according to the Kellgren-Lawrence classification were admitted to the study. The radiological changes ranged between narrowing of the joint space, the presence of osteophytes, bone density, osteolysis, and presence of intra-articular fluid and soft tissue abnormalities. The study group included 72 (43.9%) patients with stage II and 92 (56.1%) patients with advanced stage of the disease.

3.3. Assessment of patients with osteoarthritis by clinical instruments

Pain was the main symptom of the disease reported by patients. We quantified this subjective symptom using a visual analogue scale. When applied at the beginning of this study (T0), the results showed an average level of pain according to VAS - 61.8 ± 16.7 mm with wide variations, from 10 to 100 mm, which corresponded to mild discomfort to unbearable pain. To make it clearer,

we decided to divide patients from both groups into subgroups according to the intensity of pain, as shown in Figure 2.

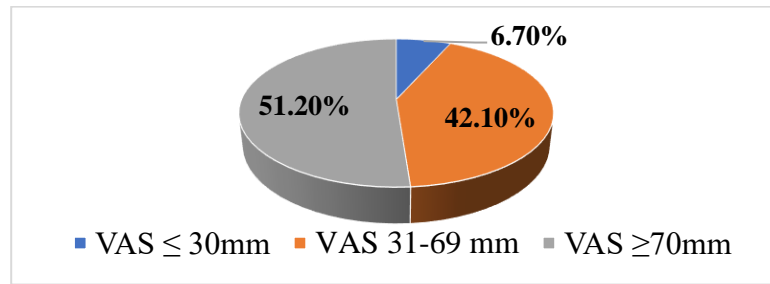


Figure 2. Pain level by VAS at baseline (T0).

When comparing the results of VAS assessment, both study groups proved to be homogeneous. Health impact assessment from the patient's perspective at time T0 for the entire study group (n = 164) was 60.9 ± 16.4 mm, comparatively higher to the assessment provided by the physician MDGA - $57.8 \pm 15, 6$ mm. Therefore, we can conclude that patients rated their own condition as more serious, passively considering the subjective condition, compared with the assessment of doctors who gave a lower level of patient's overall condition, focusing on objective signs such as inflammation and imaging data. However, the differences were statistically insignificant ($p > 0.05$).

The assessment of joint functionality and disability degree was carried out by KOOS (figure 3). The KOOS pain domain was assessed as mean pain level ($54.2 \pm 18.6\%$), similar to the symptom range, assessing the impact of joint cracking and morning stiffness (KOOS Symptoms $57.8 \pm 12.3\%$). However, it should be mentioned that OA, by decreasing joint functionality, causes a decrease in the ability to perform daily activities (KOOS ADL $44.6 \pm 17.9\%$), thus affecting sport practice and intense physical work (KOOS sport $15.8 \pm 21, 1\%$) and causing a low quality of life (KOOS CV $32.1 \pm 23.2\%$). The degree of functional disability is more pronounced when associated with inflammatory syndrome indicated by ESR ($-0.33, p < 0.01$).

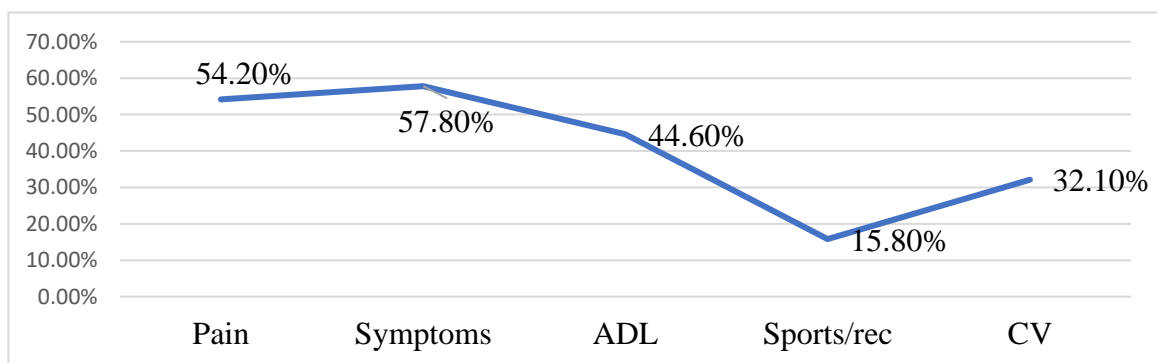


Figure 3.

The Knee injury and Osteoarthritis Outcome Score at baseline T0 (n=164).

The KOOS reflects the impact of the disease on 5 main areas, being also a sensitive score for the increase in the inflammatory syndrome and the intensity of pain. In the total group (n = 164) KOOS pain caused an inversely related dependence on the quadriceps muscle tone ($r = -0.4$, $p < 0.0001$), thus, a decrease in muscle tone led to a more pronounced functional disability, exhibiting a directly proportional correlation with pain intensity ($r = 0.3$, $p < 0.001$).

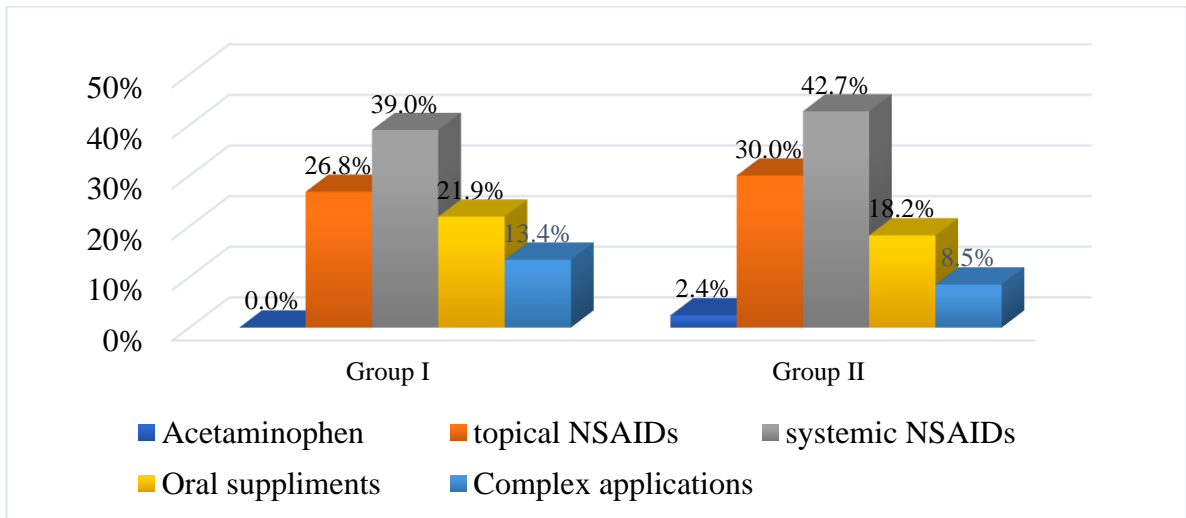
3.4. Risk factors in patients with knee osteoarthritis

There are certain risk factors that strongly influence the development and progression of OA. According to specialized literature, they are grouped into major risk factors, such as family history, age > 50 years, menopause and local risk factors like intense physical activity, repetitive traumas, sports, wearing high- heeled shoes and knee surgery. Summing up, most patients with OA under the study were over 50 years old (96.3%), thus implying multiple comorbidities and the coexistence of comorbidities that can affect the patient's condition, which resulted in certain restrictions on physical therapy.

3.5. Pharmacological and non-pharmacological treatment of the patients under study.

Osteoarthritis management includes a series of pharmacological options and non-pharmacological interventions. In accordance with the latest OARSI recommendations, OA treatment should be tailored to each case and consists of the combination of drug treatment to relieve symptoms (e.g. systemic or topical NSAIDs) and non-pharmacological treatment, including regular exercise, educational measures, weight loss, as well as wearing means of support and movement. To achieve the purpose of this research, we were interested in the treatment administered by patients under study.

Data on the systemic and topical administration of drugs were analysed for each group of patients, to ensure the group homogeneity. Furthermore, intra-articular drugs administration has also been considered, as presented in Figure 4.



Thus, we can observe the homogenisation of groups I and II regarding drugs administration.

Figure 4. Frequency and type of topical treatment administered over the last 12 months in both groups.

Based on the data analysis of the treatment used by the patients from both study groups over the last 12 months, we determined the variety of therapeutic approaches in patients with OA. Most patients opted for pharmacological treatment: group I - 72 (87.8%) patients and group II - 74 (90.2%) patients, $p > 0.05$. Pain control is the main goal of each therapeutic program, being the prevalent clinical element of multifactorial origin in both non-cartilaginous intra-articular and periarticular structures.

4. EVALUATION OF KINETOTHERAPEUTIC TREATMENT EFFECTIVENESS IN PATIENTS WITH KNEE OSTEOARTHRITIS

4.1. Dynamics of functional parameters at T1 and T2

On completion of the 10-day rehabilitation treatment (Q1) and over one month after (Q2), the patients were re-assessed by clinical instruments to observe the dynamic evolution of the knee joint mobility. The data presented in Table 1 revealed that after 10 days of physiotherapy, the range of motion in the knee joint of the patients increased considerably, when measured with a goniometer. Thus, when comparing the knee joint mobility with active flexion to the thigh extended to T0 and T1, it increased, on average, from $89.7 \pm 10.5^\circ$ to $96.0 \pm 11.2^\circ$ ($p < 0.01$) for the right leg and from $94.2 \pm 11.4^\circ$ to $99.9 \pm 10.9^\circ$ ($p < 0.01$) for the left leg in patients from group I. Equally remarkable results were recorded in group II, where the range of motion in the knee joint increased from $87.4 \pm 6.2^\circ$ to $98.9 \pm 7.5^\circ$ for the right leg and from $90.7 \pm 8.7^\circ$ to $107.6 \pm 22.0^\circ$ (by about 17°) for the left one, which is a statistically significant progress $p < 0.01$.

Table 1. The evolution of the range of motion of the knee joint over time (in both groups)

Active knee flexion with hip extension					
Group I			Group II		
Time	Right	Left	Right	Left	p
T0	89,7 ± 10,5 *	94,2 ± 11,4*	87,4 ± 6,2 *	90,7 ± 8,7 *	>0.05 <0.05
T1	96,0 ± 11,2	99,9 ± 10,9	98,9 ± 7,5	107,6 ± 22,0	>0.05 <0.05
T2	99,9 ± 13,2 **	104,2 ± 11,9 **	103,3 ± 20,1	109,6 ± 7,6	>0.05 <0.05
Active knee flexion with the hip flexion					
T0	98,2±9,2 *	104,0±11,7 *	95,8±5,8 *	99,9±9,2 *	<0.05 <0.05
T1	104,8±10,4	109,2±11,3	108,6±7,4	112,1±8,6	<0.01 >0.05
T2	108,5±12,2**	114,1±12,8**	114,9±6,7*	118,0±6,6*	<0.01 <0.05
Passive knee flexion					
T0	105,1 ± 13,0 *	110,1 ± 15,1 *	101,0 ± 7,2 *	102,0 ± 9,4 *	<0.05 <0.01
T1	112,6 ± 11,3	117,6 ± 13,5	113,3 ± 10,1	113,1 ± 10,4	>0.05 <0.05
T2	116,0 ± 11,6	121,3 ± 12,4	119,5 ± 10,1*	118,7 ± 9,7*	<0.05 >0.05
Active knee extension deficit					
T0	6,8 ± 3,5 *	3,4 ± 3,7	7,8 ± 2,7 *	4,8 ± 3,4 *	<0.05 <0.05
T1	4,5 ± 3,4	2,7 ± 3,2	3,2 ± 2,4	1,2 ± 2,2	<0.01 <0.01
T2	2,9 ± 3,2	1,7 ± 2,3	1,8 ± 2,3*	0,7 ± 1,7	<0.05 <0.01

*p <0.01; ** p <0.05

Regarding the evolution of range of motion in active knee flexion with the extended hip, over one month after the treatment completion (T2), statistically significant differences were reported in group I, ranging from $96.0 \pm 11.2^\circ$ to $99,9 \pm 13.2^\circ$ for the right leg and from $99.9 \pm 10.9^\circ$ to $104.2 \pm 11.9^\circ$ for the left leg ($p < 0.05$). In group II, the range of motion in active knee flexion with the hip extended also improved over one month after physiotherapy ended, though less significantly, ranging from $98.9 \pm 7.5^\circ$ to $103.3 \pm 20.1^\circ$ for the leg right and from $107.6 \pm 22.0^\circ$ to $109.6 \pm 7.6^\circ$ for the left, nonetheless the values were higher than those from group I. In patients from group I, the knee mobility in active knee flexion with flexed hip increased at T1 from $98.2 \pm 9.2^\circ$ to $104.8 \pm 10.4^\circ$ for the right leg and from $104.0 \pm 11.7^\circ$ to $109.2 \pm 11.3^\circ$ for the left, both being statistically significant ($p < 0.01$). Moreover, the progress over one month after treatment completion (T2) maintained both for the right foot (from $104.8 \pm 10.4^\circ$ to $108.5 \pm 12.2^\circ$

($p < 0.05$) and for the left one (from $109.2 \pm 11.3^\circ$ to $114.1 \pm 12.8^\circ$), showing an equally statistical significance ($p < 0.05$). The knee joint mobility of the patients from group II with the hip flexed increased towards T1 from $95.8 \pm 5.82^\circ$ to $108.6 \pm 7.4^\circ$ for the right leg and from $99.9 \pm 9.2^\circ$ to $112.1 \pm 8.6^\circ$ for the left, both revealing a statistical significance ($p < 0.01$). Furthermore, the progress over one month after the end of treatment (T2) has considerably maintained in both legs, from $108.6 \pm 7.4^\circ$ to $114.9 \pm 6.7^\circ$ ($p < 0.01$) for the right limb, and by at $112.1 \pm 8.6^\circ$ to $118.0 \pm 6.6^\circ$ for the left one ($p < 0.01$). Thus, at the end of the 10-day treatment, there was an improvement of the range of motion in passive knee movements among patients from group I, shifting from $105.1 \pm 13.0^\circ$ to $112.6 \pm 11.3^\circ$ for the right limb and from $110.1 \pm 15.1^\circ$ to $117.6 \pm 13.5^\circ$ for the left one, respectively, both results being statistically significant ($p < 0.01$).

However, the results re-assessed in this group over 30 days after the end of program did not show a statistically significant improvement ($p > 0.05$), increasing by only 3.4° (from $112.6 \pm 11.3^\circ$ to $116.0 \pm 11.6^\circ$) for the right limb and 3.7° for the left limb (from $117.6 \pm 13.5^\circ$ to $121.3 \pm 12.4^\circ$). In group II, passive knee flexion, after 10 days of treatment, improved from $101.0 \pm 7.2^\circ$ to $113.3 \pm 10.1^\circ$ (by almost 12.3°) for the right leg and from $102.0 \pm 9.4^\circ$ to $113.1 \pm 10.4^\circ$ (approximately 11.1 degrees) for the left limb, registering a statistically significant difference ($p < 0.01$). Significant results were maintained one month after the end of treatment (T2): passive knee flexion increased from $113.3 \pm 10.1^\circ$ to $119.5 \pm 10.1^\circ$ for the right leg and from $113.1 \pm 10.4^\circ$ to $118.7 \pm 9.7^\circ$ for the left leg, the values being statistically significant in both cases ($p < 0.01$). Thus, in group I, the range of motion in active extension of the right knee joint improved significantly after a 10-days treatment, the values decreasing from $6.8 \pm 3.5^\circ$ to $4.5 \pm 3.4^\circ$ ($p < 0.01$), which kept improving even over a month after the physiotherapy program, reaching the value of $2.9 \pm 3.2^\circ$, though no statistical significance was registered ($p > 0.05$). However, the knee extension of the left limb did not show significant results after 10 days of treatment, shifting from $3.4 \pm 3.7^\circ$ to only $2.7 \pm 3.2^\circ$, the improvement being statistically significant ($p > 0.05$). Yet, the results were obvious when compared to the values obtained more than one month after the completion of the rehabilitation program (T2) viz. $1.7 \pm 2.3^\circ$ ($p < 0.01$). As for the results in group II, the extension of the limb in the knee joint also significantly improved by the 10th day (T1): from $7.8 \pm 2.7^\circ$ to $3.2 \pm 2.4^\circ$ for the right limb and at $4.8 \pm 3.4^\circ$ to $1.2 \pm 2.2^\circ$ for the left knee, both being statistically significant ($p < 0.01$). Positive dynamics was recorded more than 30 days after the end of the course, both for the right limb - having reached a significant value of $1.8 \pm 2.3^\circ$ ($p < 0.01$), and for the left limb - $0.7 \pm 1.7^\circ$, however, no statistically significant difference was recorded in this case ($p > 0.05$).

Muscle strength was assessed manually, by assessing the quadriceps muscles (right femoral, vast medial, intermediate and lateral muscles) and ischiocrural muscles (long head of the biceps femoris (lateral), semitendinos (medial) and semimembranosus (lateral) muscles) (Table 2). At time T1, statistically significant differences were found between knee stability for both limbs, more obvious in group II ($p < 0.01$). Quadriceps strength continued to improve and remained the same one month after the treatment completion, as well as changes were more significant in group II ($p < 0.01$). Hamstring muscle strength improved in both groups after completing the 10-day physiotherapy program. Statistically significant differences between the groups were recorded at all stages of participation in the study, while the strength of the hamstring muscles was higher in group II patients in both limbs ($p < 0.01$).

Table 2. Knee joint stability assessment: quadriceps muscle

Limb	Quadriceps strength				p
	Group I		Group II		
	Right	Left	Right	Left	
T0	3,7 ± 0,5	3,9 ± 0,7	3,9 ± 0,5	4,4 ± 0,6	<0.05 <0.01
T1	4,1 ± 0,7*	4,2 ± 0,8**	4,5 ± 0,5*	4,7 ± 0,5*	<0.01 <0.01
T2	4,4 ± 0,6*	4,4 ± 0,5	4,9 ± 0,3*	4,9 ± 0,2*	<0.01 <0.01
Hamstring Muscle Strength					
T0	3,9 ± 0,4	4,2 ± 0,5	4,4 ± 0,6	4,7 ± 0,5	<0.01 <0.01
T1	4,4 ± 0,6*	4,6 ± 0,5*	4,7 ± 0,4*	4,8 ± 0,4	<0.01 <0.01
T2	4,6 ± 0,5**	4,7 ± 0,5	4,9 ± 0,3*	4,9 ± 0,3	<0.01 <0.01

Measurement of mid-patellar circumference (MPC) in dynamics after 10 days and at one month after the therapy, as well as when comparing data from groups showed a slight decrease in circumferences, possibly due to a reduced oedema and / or weight loss as a result of an increased physical activity of patients and a reduced pain and OA symptoms. Repeated measurements over a month did not show a significant decrease in MPC ($p > 0.05$), but they confirmed the therapeutic effectiveness at a significant time after its completion, which maintained in group I on the right leg, having an average value of 43.6 ± 2.3 cm vs. 43.8 ± 2.9 cm in group II and, on the left leg - 43.2 ± 2.5 cm vs. 43.8 ± 3.1 cm (ranging between 40-49 cm), respectively.

4.2. Clinical assessment of the research results of knee osteoarthritis in both study groups

Comparative data analysis of pain dynamics at T1 and T2 showed that both treatment programs were effective, though in group II after 10 days of treatment (T1), the VAS decreased by more than half from the initial one and continued to decrease more significantly than in group I ($p < 0.01$) even one month after (T2) the completion of the complex rehabilitation program ($p < 0.01$) (figure 5).

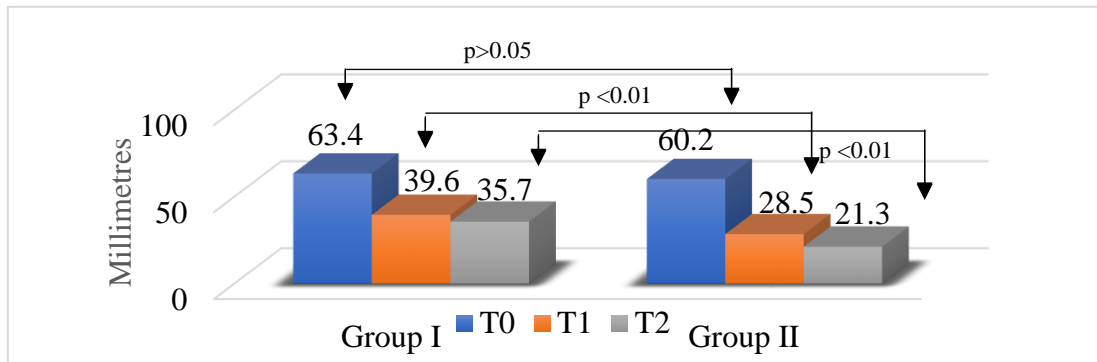


Figure 5. Dynamics of joint pain intensity according to the VAS scale

Similar to pain assessment, the overall effect of the disease was evaluated by the patient's self-assessment of Patient Global Assessment (PGA) Thus, if at the beginning of the research the patients in group I assessed their general health as being severely impaired, with an estimated PGA of an average value of 63.6 ± 13.5 mm (iv. 30-95 mm), then at T1, patients re-assessed their general health status, on average as 53.3 ± 11.1 mm (iv. 25 - 70 mm), which represents a significant improvement ($p < 0.01$). Positive dynamics was also recorded one month after the completion of the rehabilitation program, PGA per group averaging 43.9 ± 13.3 mm (iv. 15 - 60 mm) ($p < 0.01$). Patients from group II self-assessed their general health condition at study entry (T0) as unsatisfactory, PGA averaging 58.2 ± 18.5 mm per group (iv. 10 - 80 mm).), however after 10 days of combined rehabilitation treatment (T1), patients experienced a considerable overall improvement, the PGA score decreasing to 34.1 ± 13.1 mm (iv. 0 - 60 mm) ($p < 0.01$), while over a month after the treatment completion , the average value of PGA was - 28.1 ± 13.8 mm (0 - 55 mm). Physician assessment (MDGA) in group I at baseline (T0) averaged 60.4 ± 13.9 mm (iv. 25-85 mm) per group of patients with unsatisfactory condition. A clear improvement was recorded after 10 days of therapy (T1), generally reaching a satisfactory level of 48 ± 12.5 mm (i.v. 20-65 mm). One month after the completion of the rehabilitation program (T2), moderate progress was noted, on average 41.0 ± 12.1 mm (iv. 15-60 mm). An objective analysis of the overall health

evolution of patients from group II under the study allowed to highlight a positive trend from 55.2 ± 17 mm (iv. 10 - 80 mm), at the beginning of the study (T0), for most patients being unsatisfactory and 34.5 ± 12.4 mm (IV 5-60 mm) after 10 days of combined treatment (T1), being satisfactory for a great number of patients, reporting a good and very good health condition one month after completion of the rehabilitation program (T2) and averaging 28.0 ± 13.1 mm (iv. 0 - 50 mm).

Comparison of mean MDGA values at T1 between groups showed statistically significant differences ($p < 0.01$), the mean value being higher in group I compared to group II (48 ± 12.5 mm vs. 34.5 ± 12.4 mm).), indicating a better general condition in group II. As for the MDGA value more than one month after the end of treatment, it also proved to be statistically significantly higher in group I vs. group II (41.0 ± 12.1 mm vs. 28.0 ± 13.1 mm, $p < 0.01$), which means a satisfactory condition in group I vs. a very good one for group II.

We continued the research by evaluating the effectiveness of rehabilitation programs on joint functionality as related to disability, which were assessed according to KOOS and applied at predefined time intervals (T0, T1 and T2) (Table 3).

Table 3. Comparative analysis of joint functionality by KOOS score

KOOS	Pain		Symptoms		ADL		Sport/rec		QoL	
	Gr. I	Gr.II	Gr. I	Gr.II	Gr. I	Gr. II	Gr. I	Gr. II	Gr. I	Gr. II
T0	55,5 ±13,9	52,9 ±22,3	59,1 ±18,7	56,6 ±19,1	46,3 ±25,0	43,0 ±19,9	15,6 ±17,3	15,9 ±24,4	29,3 ±22,2	34,8 ±23,9
	p > 0.05		p > 0.05		p > 0.05		p > 0.05		p > 0.05	
T1	63,4 ±13,6	64,3 ±19,1	65,6 ±18,1	69,0 ±15,9	54,5 ±16,0	55,1 ±18,2	23,0 ±19,6	30,5 ±23,6	36,5 ±22,9	50,6 ±18,9
	p > 0.05		p > 0.05		p > 0.05		p < 0.05		p < 0.01	
T2	69,5 ±12,7	74,8 ±15,2	72,0 ±16,8	79,9 ±12,1	62,4 ±14,9	66,3 ±16,2	28,6 ±19,4	42,1 ±23,3	43,9 ±22,1	61,9 ±16,2
	p < 0.05		p < 0.01		p > 0.05		p < 0.01		p < 0.01	

The comparative analysis between groups of the KOOS domains did not reveal statistically significant differences at the beginning of the study ($p > 0.05$). The most significant changes started to occur only after 10 days of active treatment (T1). Thus, the dynamics was more obvious in group II, where sports and recreation showed the greatest impact on the KOOS score compared to

group I (23.0 ± 19.6 vs. 30.5 ± 23.6 , $p < 0.05$), as well as quality of life (36.5 ± 22.9 vs. 50.6 ± 18.9 , $p < 0.01$), the other differences between groups being non-significant. However, one month after the end of treatment, both in group I and group II, there was a progress in pain management, being more improved in group II vs. group I (74.8 ± 15.2 vs. 69.5 ± 12 ; $p < 0.05$), as well as on symptoms (72.0 ± 16.8 vs. 79.9 ± 12.1 ; $p < 0.01$). These improvements also directly impacted sports and recreational activities (28.6 ± 19.4 vs. 42.1 ± 23.3 ; $p < 0.01$), as well as quality of life (43.1 ± 22.1 vs. 61.9 ± 16.2 ; $p < 0.01$), which kept improving even at one month after the completion of the rehabilitation procedures, the results being statistically significantly better in group II.

4.3. Patients' compliance with the therapeutic program in both groups

Kinesitherapy has been found to play an important role in relieving pain and improving joint function in patients with knee OA that upon completion of the rehabilitation program in medical clinics, is recommended to be continued at home. However, according to specialized literature, long-term adherence to physical therapy programs is low and effective approaches to its improvement are limited [15]. Assessment of patients' adherence to the therapeutic program was carried out by direct observation and by recording the number of cancelled or rescheduled patients' visits in both groups over 10 days of the rehabilitation program, as well as by interviewing the patients upon their compliance and factors that influenced the low amount of exercises required to be performed within one month after the end of the program. These factors were evaluated at T2 (figure 6).

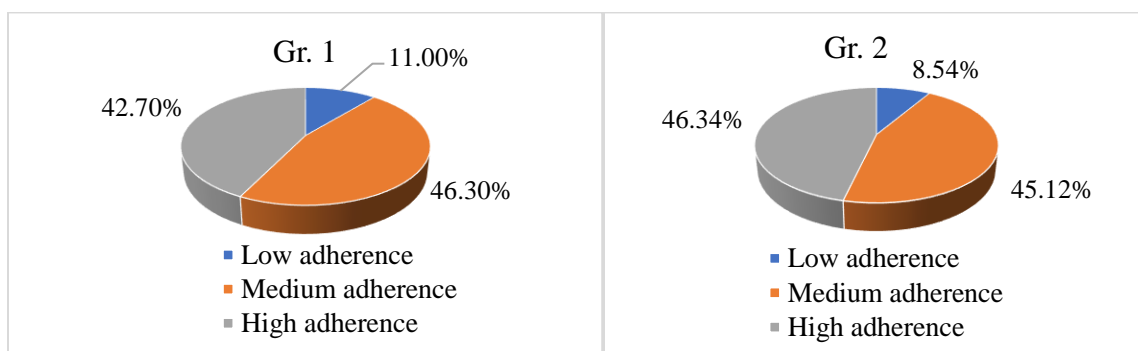


Figure 6. Compliance with the exercise program at home in both study groups.

Patients from group II, who underwent a combined treatment, exhibited a higher adherence to the treatment. Adherence to treatment, including physiotherapy, is an important factor that can affect the outcome of a rehabilitation program; factors affecting adherence to exercise among patients with OA are poorly understood [16,17].

4.4. Integrated behaviour of the patient with knee OA

This present research paper was aimed to evaluate the effectiveness of physiotherapy programs and to develop an optimal program in terms of curative and prophylactic means, as well as educating the patients with OA on how to improve quality of life and long-term outcomes for better social reintegration (figure 7). The results of our research showed a major impact of OA on multiple aspects of health, as well as on their quality of life of patients. The evolution of the disease is determined by the interaction of certain risk factors (obesity, gender, comorbidities, traumas, and workplace), family history and the starting time of recovery treatment. Thus, the progressive and irreversible nature of the disease determines the multifaceted effect on the patient. Literature analysis and experience in the field of recuperative management of the patients with osteoarthritis of the knee allowed the elaboration of their integrated conduct by the rehabilitation doctor.

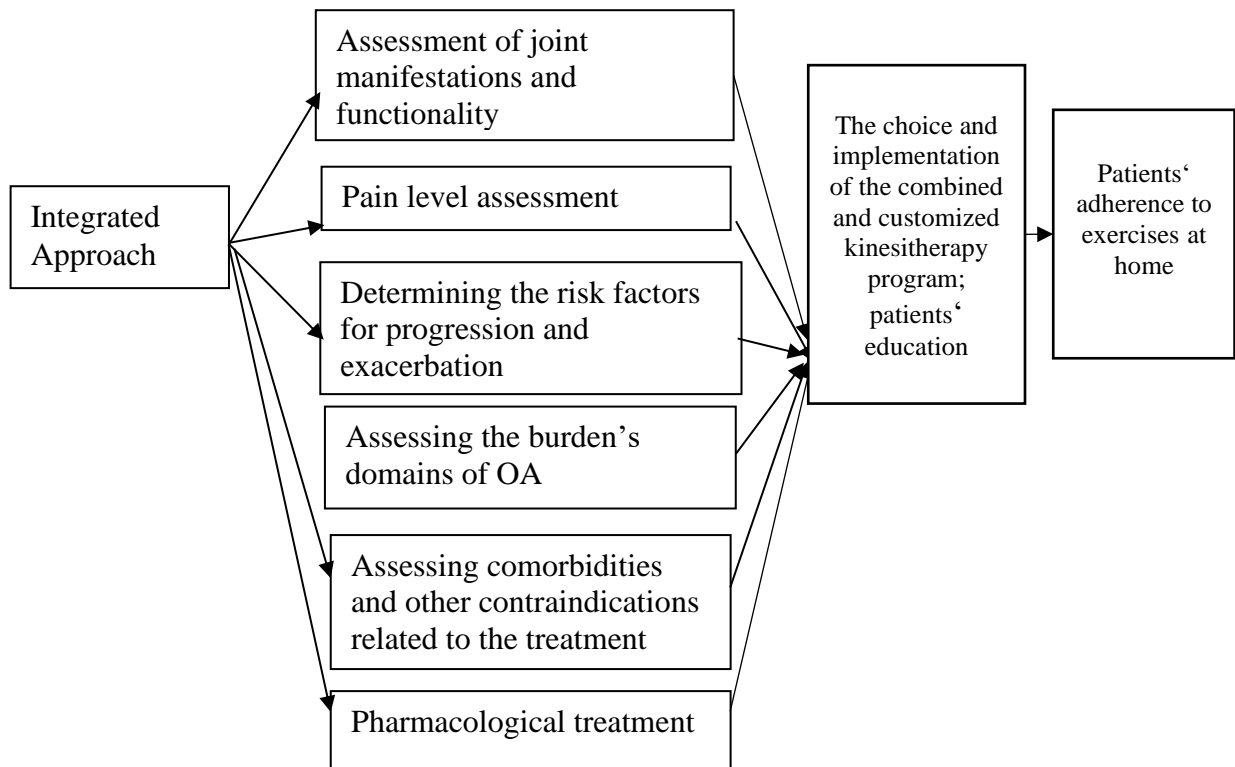


Figure 7. Scheme of the integrated approach of the patient with knee OA developed by the rehabilitation doctor.

The effectiveness of the program was assessed as related to the conventional program by re-assessing the outcomes at the end of the program T1 (after 10 days) and over 30 days (T2). The research results showed that practicing recommended active resistance exercises for 2 weeks (10

sessions) reduces pain intensity and significantly improves overall mobility. Currently, the disease management is guided by the OARSI recommendations with the additions from 2010 [6,18]. Therapeutic treatment of knee OA includes many non-pharmacological options and pharmacological interventions. Treatment must be individually tailored and consist of a combination of methods. Non-drug treatment includes regular exercise, educational activities, weight loss, equipping with aids and outpatient supplies [19]. Pain relief is the main reason for medication for osteoarthritis; Chondroprotection remains a desideratum [6] due to less scientific evidence [19]. The drugs registered as food additives (glucosamine, chondroitin) have only a slight effect on the activity of chondrocytes. Traditionally, NSAIDs are the most widely used therapeutic agents in OA, both in the non-specific class and in specific COX-2. Their administration should be carried out both in terms of advantages, but especially in terms of disadvantages [20].

In patients with knee OA, kinesitherapy is effective in reducing pain immediately after treatment and increasing joint functionality, compared to non-physiotherapy interventions [21]. However, in order to provide evidence-based treatments and achieve the expected results, it is necessary to select and compare various physiotherapy programs [22]. Thus, using conventional programs focused on restoring joint mobility and stability and muscle strength, supplemented by manual techniques over 10 days, might show short or long-term positive effects in reducing pain and improving joint function. The implementation of counselling techniques has increased the patient's adherence to the therapeutic program. Communicating with the patient, educating them about the benefits of exercise, will improve the patient's adherence to follow the exercise program at home and will maintain the effectiveness of the rehabilitation program over time.

GENERAL CONCLUSIONS

1. The present study showed that one major symptom in knee osteoarthritis is pain, being recorded in 161 cases (98.2%) and a decrease in joint function by reducing the active knee flexion with thigh extended on average - $88.6 \pm 8.7^\circ$ (right LL) and - $92.4 \pm 10.2^\circ$ (left LL) and with the thigh flexed - $103.0 \pm 10.7^\circ$ (right LL), and - $107.1 \pm 12.9^\circ$ (left LL), as well as a deficit of active extension in sagittal plane - $7.3 \pm 3.2^\circ$ (right LL), and - $4.2 \pm 3.6^\circ$ (left LL).
2. The study revealed that knee osteoarthritis is related to a decreased joint functionality, estimated by the KOOS/Pain scale at $54.2 \pm 18.6\%$, associated with a lower daily activity - KOOS ADL $44.6 \pm 17.9\%$ and significant functional disability in practicing of sport and extreme physical exertion - KOOS sport $15.8 \pm 21.1\%$, determining a low quality of life - KOOS QOL $32.1 \pm$

23.2%. The degree of functional disability was more pronounced in the presence of the association of inflammatory syndrome indicated by ESR (-0.33, $p < 0.01$).

3. The medical rehabilitation program combined with specific manual therapy techniques improved joint functionality, with significant differences between groups, with increasing amplitude of active flexion with the thigh extended (Second group knee: right - 98.9 ± 7.5 , left- 107.6 ± 22.0 ; First group knee: straight- 96.0 ± 11.2 °, left- 99.9 ± 10.9 °, $p < 0.05$) and active flexion with the hip flexed (Second group knee: right - 108.6 ± 7.4 °, left- 112.1 ± 8.6 °; First group knee: right - 104.8 ± 10.4 °, left- 109.2 ± 11.3 °, $p < 0.05$) and reduction of the knee extension deficit (Second group knee: right 3.2 ± 2.4 °, left 1.2 ± 2.2 °; First group knee: right -4.5 ± 3.4 °, left- $2, 7 \pm 3, 2$ °). The results were maintained at intervals of 30 days mainly in group II with combined treatment.
4. The medical rehabilitation program combined with manual therapy techniques increased the quality of life of patients, assessed by the PGA index (Group II- $34,1 \pm 13,1$ mm, Group I- $53,3 \pm 11,1$ mm, $p < 0,01$) and KOOS QOL (Group II T1- $50,6 \pm 18,9\%$, Group I-T1- $36,5 \pm 22,9\%$, $p < 0,01$), values being maintained even after 1 month after the completion of the rehabilitation program (Group II-T2- $61,9 \pm 16,2\%$, Group I-T2- $43,9 \pm 22,1$, $p < 0,01$), including a higher level of adherence to the doctor's recommendations.
5. The usage of manual therapy techniques in combination with the conventional rehabilitation program has demonstrated a greater increase in joint function and a reduction in disability caused by gonarthrosis.

PRACTICAL RECOMMENDATIONS

1. Large-scale implementation of osteoarthritis prophylaxis measures within primary and specialized outpatient care by educating patients, reducing modifiable risk factors, increasing physical activity, and adopting physiotherapy interventions as early as possible.
2. Including in the initial assessment of the patient with gonarthrosis the evaluation of both traditional somatoscopic and somatometric indicators and the KOOS index, which is an appropriate questionnaire to assess joint functionality and quality of life of patients with o knee osteoarthritis.
3. To optimize the rehabilitation of joint functionality, the scheme of integrated approach should be used in treatment of patients with knee osteoarthritis in the practice of rehabilitation physicians.
4. The usage by rehabilitation physicians of an individualized rehabilitation program by combining conventional methods with manual therapy techniques, will decrease pain and improve joint functionality in patients with knee osteoarthritis.

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1. ȘALARU, V., VIZDOAGĂ, A., CUROCICHIN, GH., MAZUR, M. *Osteoartroza: lecții învățate, lecții de învățat. Vicisitudini de la anamnezic la diagnostic*. Coordonatori Mazur-Nicorici, L., Diaconu, C. Chișinău: Tipografia "Impressum", 2019, pp. 50-54.

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3. VIZDOAGĂ, A., ȘALARU, V., MAZUR-NICORICI, L., MAZUR, M. *Comorbiditățile la pacienții cu osteoartroza genunchiului influențează sau nu programul kinetoterapeutic*. Știința culturii fizice. 2018, nr. 30/1, pp. 136-141.
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- **Participation at scientific forums (posters):**

✓

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