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Influence of the physical activity in the elderly people diagnosed with knee osteoarthritis during the pandemic period caused by COVID-19

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Abstract

Introduction. Knee osteoarthritis is considered to be a chronic disease that affects the joints by causing pain, joint stiffness and decreased functional capacity. Regular physical activity can keep and increase functional capacity, it can reduce pain by improving movement behavior. The disruption of the sedentary behavior of the elderly patients with knee osteoarthritis can lead to improved physical function and general health. **The purpose** of this paper is to point out the role of physical activity in the elderly people diagnosed with knee osteoarthritis during the COVID-19 pandemic. **Material and method.** A total of 155 patients diagnosed (clinical and imaging) with knee ostoarthritis, who were treated on an outpatient basis, from May to September 2020, were studied. The parameters assessed in the study were pain, joint stiffness, the ability to carry out daily activities, anxiety and quality of life. **Results and discussion.**The studied group of patients was homogeneous in terms of the weight by age group and gender. Higher values were recorded in the study group in the evaluation of patients based on scales, the results being statistically significant, with value for $p<0.05$, which means that the hypothesis was validated. **Conclusions.** Patients of the study group recorded improvementin of functional capacity, joint stability and static and dynamic balance, which allowed a faster reintegration into the family and society.

Keywords: *physical activity, pain, elderly people, knee osteoarthritis,*

Introduction

Knee osteoarthritis is considered to be a chronic disease that affects the joints by causing pain, joint stiffness and decreased functional capacity. The condition causes an important functional deficit, affecting posture, static and dynamic balance, walking (1).

Osteoarthritis is frequently accompanied by other diseases (respiratory, cardiovascular, diabetes, obesity, depression). Studies (2,3) show that 4 out of 5 people with osteoarthritis have at least another chronic condition, whereas the proportion of people with osteoarthritis by reference to comorbidity varies from 68 to 85%.

The factors that increase the risk of having osteoarthritis include age, sex, obesity, joint stress, but also some metabolic diseases, such as diabetes and hemochromatosis, a hereditary disease in which too much iron is absorbed and stored. In this context the quantitative determination of Fe3+ by the spectrophotometric method is the most commonly used due to the advantages (4).

In osteoarthritis, certain markers (C reactive protein, VSH) are correlated to the prognosis of the condition, so it is important that they are monitored (5).

The vast majority of the elderly patients diagnosed with knee osteoarthritis spend the day lying or sitting, do not do dynamic or locomotor activities (6). Over time, this behavior leads to other comorbidities, such as the cardiovascular ones (7,8).

Regular physical activity can keep and increase functional capacity, it can reduce pain by improving movement behavior. It can be evaluated, optimized and individualized according to sex, age, BMI, functional capacity, pain, comorbidities (9).

A study by Jugwa (2015) (10) pointed out the relationship between the sedentary behavior and the functional ability in the elderly people diagnosed with knee osteoarthritis, then concluded that the limitation of daily sedentarism (daily activities at home or outside it) and daily walking can improve functional capacity and reduce pain. It was found that the patients in the study were sedentary about 2/3 of the daily time whereas the speed of their walking movements was very slow.

The elderly people consider that knee osteoarthritis is a progressive, incurable disease that causes wear and tear over time (11). Thus, patients focus on pain and consider that physical exercises are no longer useful (12) and moreover, they affect the joints (13).

Therefore, the refusal to do any physical activity of low–moderate intensity (14) and in addition, the vast majority of the elderly correlate physical activity to pain (15).

However, many patients consider that pain correlates to the destruction of the joints caused by physical exercises (16).

Zhaoyang 's 2020 study (17) also shows that the lack of physical activity in the elderly people diagnosed with knee osteoarthritis causes chronic pain to persist in these patients. This study showed that the pain increased especially in the morning, which made patients to have sedentary behavior, so they did not do physical activity on the day with moderate pain. The study suggests that physical activities influence the sedentary behavior with medium and long-term benefits in order to manage pain, functional capacity and the quality of life.

The disruption of the sedentary behavior of the elderly patients with knee osteoarthritis can lead to improved physical function and general health (18). In this context, it is important to take into account the risk factors that may limit the physical activity: age, sex, BMI, pre-existing knee injuries (19). BMI was negatively correlated to walking and the number of steps taken daily. The recovery of these patients is based on behavioral interventions (20) that try to encourage movement, even if pain is present from the beginning, and the awareness of the fact that it will diminish over time.By establishing scientific education, it is possible to change the significance of pain from tissue damage marker to the need to protect the body from a danger that can be real or only perceived (16). This scientific education of pain can be considered as the basis of a biopsychosocial model of pain, disability and sensitivity, even if pain persists.

Changing the perception of pain by the patient actually means modulating pain, which is a protection feature of our system. It is necessary to distinguish between nociception and pain, regulating the mechanisms of the brain that enable the protection. Physical activity decreases "the hyperprotection of the body" imposed by the nervous system (21).

Physical exercise programs can generate positive effects on pain and functional capacity in comparison to taking simple analgesics or oral pills (22) but with reduced adverse reactions.

Physical activity is a multidimensional and complex phenomenon that requires a complex biopsychosocial approach (23), which enables understanding the characteristics of individuals regarding the acceptance and maintenance of physical activity (24). In this context, health should be analyzed from a holistic perspective, by understanding biological, social and psychological factors (25) that can induce a state of illness.

In the biopsychosocial model of health and disease, the biological, social and psychological components are not considered independent, but they interact with each other (26). In fact, physical activity is a form of body movement integrated into the daily routine. Nowadays the recovery goals in the knee osteoarthritis are to reduce pain, inflammation, to increase the quality of life and to improve physical function (27).

International clinical guidelines recommend that the first line of treatment in knee osteoarthritis is the loss of weight, supplemented by physical exercise. It has a role in the muscle toning (28) to relieve pain, to increase the muscle strength and functional capacity, being useful in the postural control, proprioceptive and coordination (29).

Physical activity, according to WHO is considered a multidimensional behavior that includes the frequency of the activity, the intensity of execution, the execution time and the type of done exercise. The protective or destructive effect seems to depend on the intensity, type and frequency of physical exercise (27), which demonstrates the importance of all the components.

The physiotherapy program structured on education and neuromuscular exercise showed short-term statistical improvements in pain and functional capacity in comparison to the usual program. In the long term, there has been an increase in the daily activities and quality of life.

It was found that demographic, physical, psychosocial and environmental factors negatively influenced the physical activity of people with knee osteoarthritis (30).

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, (31) is at increased risk for the elderly people. The important prognostic factors are age, male sex, the presence of comorbidities (high blood pressure, diabetes, kidney diseases, respiratory diseases) (32). For the elderly who live alone and who also have comorbidities, supervision is necessary in order to ensure compliance with pharmacological treatment, nutrition, emotional state and last but not least, mental health (33). The COVID-19 pandemic, by introducing lockdown, quarantine, influenced the state of health, social relations andsome activities (34). Quarantine and confinement are associated to stress, anxiety, depression, leading to reduced physical activity, to the modification of diet that has become low in vitamins and antioxidants (35).

For health, even during the pandemic period, it is essential to do regular physical exercise, 30-45 min/day, 3-5 times/week. In order to achieve the best results, the exercise program must take into account the type of exercise, the work intensity, the time of doing physical

activity. Thus, the type of physical exercise with resistance and aerobic regime can decrease the risk of infection and stimulate the immune system (36), on condition it is not for a very long period and it is not stressful (37,38).

It is recommended to do activities that can take place inside the domicile - relaxation, meditation, yoga, walking in the house, even fast walking, climbing stairs, jumping, squats, cycling- all carried out according to the functional capacity of each person and the presence of comorbidities.

If outdoor activities are allowed, it is necessary to keep the physical distance and according to the season, people can go walking, jogging, cycling, do gardening activities, family games, by complying with hygiene rules (39).

The purpose of this paper is to point out the role of physical activity in the elderly people diagnosed with knee osteoarthritis during the COVID-19 pandemic.

Material and method. A total of 155 patients diagnosed (clinical and imaging) with knee ostoarthritis, who were treated on an outpatient basis, from May to September 2020, were studied.

The objectives of this study were: to reduce pain, to keep and improve the functional capacity in the knee joints, to correct the alignment in the lower limbs, to re-educate static and dynamic balance and to re-educate gait.

The study complies with the rules of ethics and deontology according to the legislation in force.

The parameters assessed in the study were pain, joint stiffness, the ability to carry out daily activities, anxiety and quality of life.

For this, the visual analogue scale (VAS 0-100 mm) and the WOMAC subscale were applied for the pain assessment, the WOMAC subscale for joint stiffness and for the assessment of daily activities. For the assessment of general anxiety and disease-related anxiety, the S.T.A.I.-X2 and S.T.A.I. X-1 scales were used, whereas the QOL (Quality of Life) scale was used for the patients' quality of life.

The patients received treatment according to clinical guidelines, namely pharmacological treatment by nonsteroidal anti-inflammatory medication (applications on bones and local topic), antialgic, gastric, neurotrophic and decontracturant protectors.

The electrotherapy treatment included low-frequency currents (TENS-rectangular current, with antalgic role, with a frequency between 15-200 Hz, it acts by presynaptic inhibition and releases endorphins), medium frequency (interferential- with mainly analgesic action, vasomotor, hyperemic and secondary trophic, myorelaxant, in modulation 0-100 Hz in order to enable inhibitory and excitatory effects), ultrasound (a form of coupling-ultrasonophoresi with anti-inflammatory gel, for analgesic, hyperemiant, myorelaxant, application in impulse mode in order to eliminate the thermal effect, the frequency of 1 MHz, the intensity of 0.7W/cm2, for 5 minutes) (40).

Kinetic therapy consisted of sessions lasting 30 minutes/day, 3 times/week, for 4 weeks. The kinetic therapeutic program aimed at keeping and increasing joint mobility, trophicity (active exercises throughout the movement amplitude), keeping and increasing muscle strength, exercise training (free exercise, walking exercises, increase in general endurance), static and dynamic respiratory techniques, effort dosage exercises.

As for the occupational therapy, the objectives were to re-educate mobility, to enable locomotion and family and social reintegration. The following exercises were done: progressive transfer, dorsal-decubit lateral-decubit, lateral decubit-sitting, sitting-orthostatism, then climbing /descending stairs, bending and rotating the trunk, doing domestic and recreational activities.

The evaluation of the patients was made in the beginning (M1) and at the end of the recovery treatment (M2), as well as at the control 6 weeks after its completion (M3).

The inclusion criteria were: the age over 60, clinical diagnosis and imaging of knee osteoarthritis, without decompensated and neurological conditions, who agreed to participate in the study. The exclusion criteria were: patients aged less than 60, with diseases of the respiratory and cardiovascular system in the decompensated stage, with neuro-psychiatric disorders, non-compliant patients, and who did not wish to participate in the study.

The patients were divided into two groups as follows:

- the study group who received pharmacological treatment, electrotherapy and physical therapy
- the witness group who received pharmacological treatment and electrotherapy.

The study group involved 76 patients: 40 (57.75%) were male and 36 (42.25%) female. The control group had 79 patients of which 38 (48.65%) male and 41 (51.35% female).

Table no. 1. Distribution of patients by groups

GROUP	Sex	60-69 years	70-79 years	> 80 years	Total
Study	Male	16	13	11	40
group	Female	15	13	8	36
Control	Male	15	13	10	38
group	Female	16	14	11	41
TOTAL		62	53	40	155

Statistical analysis

The data that was obtained from the initial, final and control assessments was processed statistically by using Microsoft Excel 10. Thus the median, the standard deviation and the t-student test were calculated in order to test the work hypothesis. It was chosen the level of statistical signification of 5%, so p should be less than 0.05 ($p < 0.05$).

Results

The pain assessed by the VAS scale decreased in the study group by 42.85% at the end of the treatment and 14.28% at the control, in comparison to the control group whose pain reduction was 37.5% at the end of the treatment and 25% at the control.

Table no. 2. Evolution of pain with the VAS scale

Scale VAS	M1	M2	M3
Study group	7±0.84	4±1.17	3±0.93
Control group	8±1.61	5±1.15	3±0.88

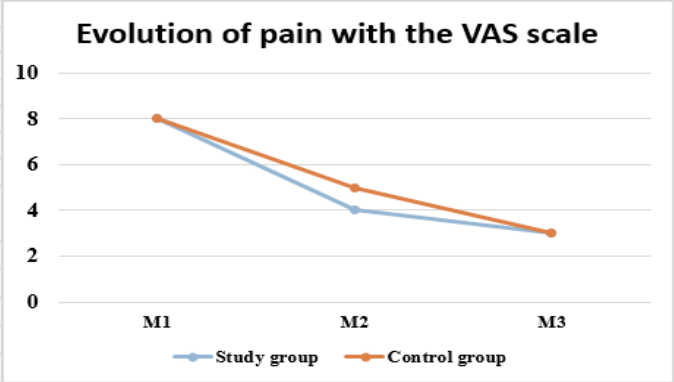


Chart no. 1. Evolution of pain with the VAS scale

The pain parameter assessed with the WOMAC subscale shows a decrease of 41.17% in the study group in comparison to 37.5% in the control group at the end of the treatment . During the control, the decrease is 29.41% in the study group versus 25% in the control group.

Table no. 3. Evolution of pain by using the WOMAC scale

Scale WOMAC	M1	M2	M3
Study group	17±1.17	10±0.11	5±0.25
Control group	16±1.51	10±0.71	6±0.49

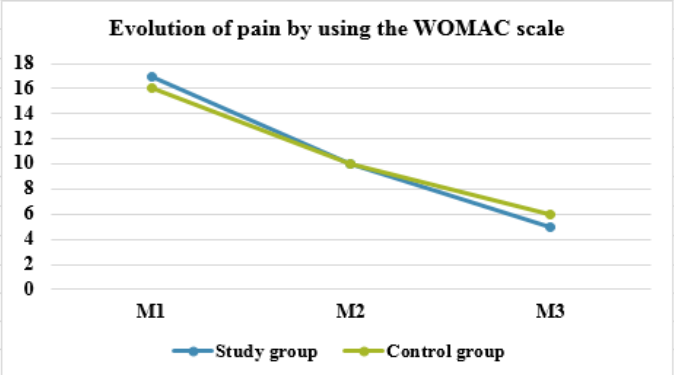


Chart no. 2. Evolution of pain by using the WOMAC scale

As for the functional capacity for daily activities, there was an increase in the abilities of 39.15% in the study group while completing the treatment and 30.43% in control, whereas in the control group this increase was 43.75% at the completion of the treatment and 22.91% at the control.

Table no. 4. Evolution of the WOMAC subscale-functional capacity

The WOMAC subscale	MOMENT		
functional capacity	M1	M2	M3
Study group	46±4.01	28±0.38	14±0.53
Control group	48±5.40	27±3.37	16±1.52

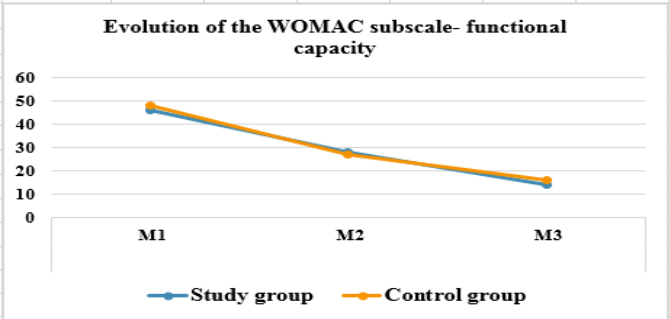


Chart no. 3. Evolution of the WOMAC subscale-functional capacity

The WOMAC score, representative of the arthrosis phenomenon, allowed an overall assessment of patients with knee osteoarthritis and an increase of 38.57% at the end of the treatment and 30% at the control group, and in the control group of 43.05% at the end of the treatment and 22.22% at the control.

Table no. 5. Evolution of the WOMAC scale

Scale WOMAC	M1	M2	M3
Study group	70±4.30	43±2.28	22±0.41
Control group	72±6.14	41±3.56	25±1.54

Anxiety as a condition caused by registered knee osteoarthritis, with the S.T.A.I.-1 scale, the decrease in anxiety by 24.19% at the end of the treatment and 29.83% at the control. In the control group the reduction of anxiety as a state was 37.3% at the end of the treatment and 16% at the control.

Table no. 6. Evolution of the S.T.A.I. X-1 scale

Scale S.T.A.I.-X1	M1	M2	M3
Study group	62±2.83	47±4.56	28.5±1.81
Control group	75±1.13	47±5.35	35±2.26

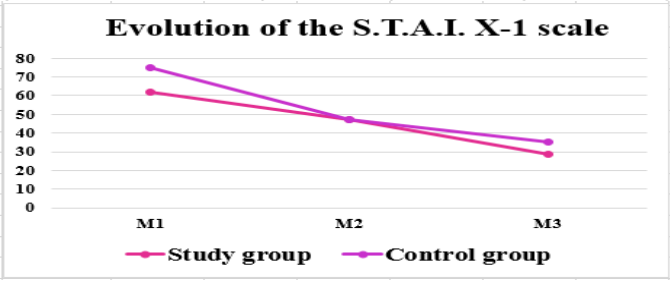


Chart no. 4. Evolution of the S.T.A.I. X-1 scale

As for anxiety as a general condition (caused by comorbidities, quarantine/confinement during the pandemic period, emotional states of patients), it registered a reduction in the study group of 26.56% at the end of the treatment and 17.18% at the control, in comparaison to the control group where the reduction

was 22.41% at the end of the treatment and 8.62% at the control.

Table no. 7. Evolution of the S.T.A.I. X-2 scale

Scala S.T.A.I.-X2	M1	M2	M3
Study group	64±3.62	47±2.91	36±1.07
Control group	58±6.95	45±3.58	40±1.28

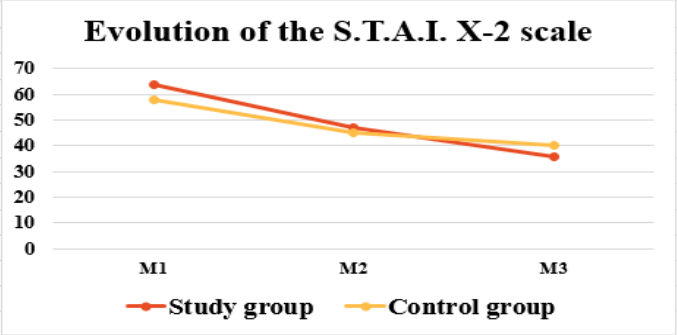


Chart no. 5. Evolution of the S.T.A.I. X-2 scale

Patients' quality of life improved. Thus, at the end of the treatment there was an increase in their quality of life of 13.79% in the study group in comparison to 9.64% in the control group, and at the control the increase was 21.83% in the study group and 18.07% in the control group. At the control in comparison to the beginning of the treatment, the quality of life improved by 35.63% in the study group and by 27.71% in the control group.

Table no. 8. Evolution of the QOL scale

Scale QOL	M1	M2	M3
Study group	56±7.57	68±8.51	87±9.48
Control group	60±4.24	68±3.52	83±1.99

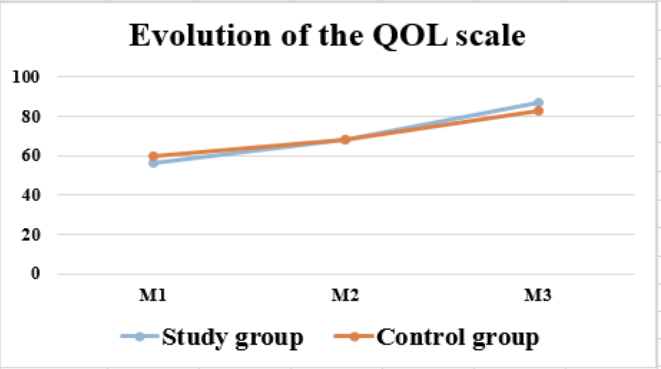


Chart no. 6. Evolution of the QOL scale

Discussion

The studied group of patients was homogeneous in terms of the weight by age group and gender. Higher values were recorded in the study group in the evaluation of patients based on scales, the results being statistically significant, with value for $p<0.05$, which means that the hypothesis was validated.

Table no. 9. T-student test values in the study group

Scale/Moment	M1-M2	M2-M3
SCALE VAS	0.0483	0.0207
Subscale WOMAC-pain	0.0341	0.0498
Subscale WOMAC-stiffness	0.0159	0.0363
Subscale WOMAC-fct. capacity	0.0315	0.0489
Scale WOMAC	0.0295	0.0097
Scale S.T.A.I. X-1	0.0128	0.0097
Scale S.T.A.I X-2	0.0061	0.0094
Scale QOL	0.0039	0.0051

In the group who also received kinetic therapy, the results are better, as it is shown by the published articles and which show that the physical exercise done regularly by the patient is a means of reducing pain, a way of increasing mobility, improving the quality of life and decreasing the anxiety state.

Thus Stranton's study (41) of 2020 shows that the treatment of individualized kinetic therapy and the education of the patient to manage pain led to the reduction of the pain and the improvement of the functional capacity.

Physical activity (14) prevents impairment of the physical capacity of the elderly patients diagnosed with knee osteoarthritis and keep their functional independence.

In the control group, after the application of the t-student test, the results are statistically significant for the VAS,WOMAC, QOL scales for all the assessment moments, except for the Womac scale for stiffness, the final moment-control, at which $p>0.05$, as shown in Table No. 10.

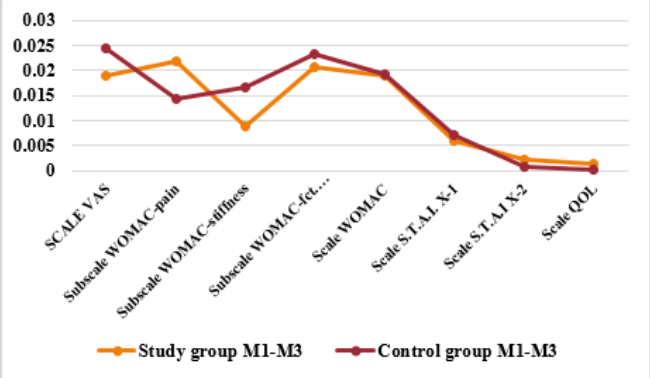
Table no.10. Evolution of the t-student test for the evaluation parameters in the control group

Scale/Moment	M1-M2	M2-M3
SCALE VAS	0.0389	0.0491
Subscale WOMAC-pain	0.0295	0.0331
Subscale WOMAC-stiffness	0.0231	0.0509
Subscale WOMAC-fct. capacity	0.0441	0.0381
Scale WOMAC	0.0399	0.0318
Scale S.T.A.I. X-1	0.0102	0.0023
Scale S.T.A.I X-2	0.0022	0.0052
Scale QOL	0.0061	0.0094

The results obtained at the t-student test between the initiation time of the treatment (M1) and the control time (M3) show significant statistical results in the study group in comparison to the control group.

Table no.11. Evolution of the t-student test in both lots

GROUP/MOMENT	Study group	Control group
Scale/TEST t-student	M1-M3	M1-M3
SCALE VAS	0.0189	0.0243
Subscale WOMAC-pain	0.0219	0.0144
Subscale WOMAC-stiffness	0.0089	0.0167
Subscale WOMAC-fct. capacity	0.0207	0.0233
Scale WOMAC	0.0188	0.0191
Scale S.T.A.I. X-1	0.0059	0.0071
Scale S.T.A.I X-2	0.0023	0.0007
Scale QOL	0.0012	0.0003



Graph no. 7. T-student test in the 2 groups

Patients have been recommended to continue at home the exercise program made in the physiotherapy rooms and as much as possible to carry out other activities such as recreation, gardening. It was also indicated to walk, to cycle to , depending on the functional capacity of each patient.

Conclusions

The application of the treatment was individualized and it took into account the stage of the disease, algic symptomatology, the patients' mobility capacity, the emotional state caused by the COVID pandemic -19.

By applying the combined treatment with electrotherapy and physiotherapy, in the study group it was found in addition to reducing pain and increasing mobility, joint function in comparison to the application of electrotherapy only in the control group.

And the anxiety state was significantly reduced in the group to whom physiotherapy was applied, whereas the improvement of the quality of life was also significant in this group.

Patients of the study group recorded improvementin of functional capacity, joint stability and static and dynamic balance, which allowed a faster reintegration into the family and society.

Author contributions.

All the authors had the same contribution

Accordance to ethics standards

The study complies with the rules of ethics and deontology according to the legislation in force.

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