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IMPACT OF COMORBIDITIES IN PATIENTS WITH KNEE OSTEOARTRITIS ON THE KINETOTHERAPEUTIC PROGRAM

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Abstract. *Kinetopherapy is indicated as a non-pharmacological treatment method of gonarthrosis, which is recommended by EULAR and OARSI. However, the coexistence of associated diseases can significantly affect the patients' condition, thus kinetotherapy should be restricted in patients with osteoarthritis of the knee (OA). The aim of the study: To identify comorbidities in patients with OA and their impact on the selection of individual rehabilitation program.*
Keywords: *kinetotherapy, knee osteoarthritis, comorbidities.*

Introduction. Osteoarthritis (OA) is the most common joint disease, characterized by heterogeneity of factors leading to symptoms and signs associated with gradual loss of cartilage, changes in both subchondral bone and margins of the joint [12].

On the one hand, the current management of the disease is guided by the OARSI and EULAR recommendations, 2013 [8], which include a variety of non-pharmacological and pharmacological measures. Non-pharmacological treatment consists of regular physical exercise, manual therapy, educational measures, weight loss, electrotherapy, maintenance and ambulatory means, whereas an individually tailored approach is a combination of these strategies [28].

On the other hand, the progressive and irreversible nature of OA determines the high rate of comorbidity [21], which, moreover, worsens the disabling prognosis of OA [14]. The US Disease Control Center reported 47% of adults with OA, who have had at least one comorbid condition [11, 22], whereas literature data ranges from 65 to 85% [5, 13, 23, 24].

Kinetotherapy is an effective measure for maintaining the knee joint functionality and reducing the pain [9]. A rehabilitation method includes stretching exercises, aerobic exercises, the increasing joint amplification exercises, joint stability, hydrokinetotherapy and daily exercises [3]. New research evidence shows that patients with OA and comorbidities are restricted to physical activity, pain and a poor joint function prognosis [25], which limits the variety of kinetotherapeutic means used.

Both the international guidelines (EULAR, OARSI) and the National Clinical Guideline for care and management of OA in Adults recommend kinetotherapy, however, when comorbidities are present, a customized kinetotherapeutic program is required. As, for example, patients with cardiovascular diseases and cardiac insufficiency avoid intense physical exertion due to decompensation [16], whereas obesity and respiratory diseases may lead to dyspnea.

The research results of Rooij M. and coauthors have revealed a number of restrictions and contraindications for kinetotherapy, caused by associated diseases in patients with OA. Three types of physical restrictions have been identified: (1) body structure and function (2) psychological or behavioral disorders and (3) environmental deficiency. In some cases of kinetotherapy, restrictions can turn into contraindications, such as the progression of heart failure or polyneuropathy in diabetes. Thus, the distinction between restrictions and contraindications depend on such factors as the context, severity and time of onset [18].

Currently, the clinical protocols and kinetotherapeutic rehabilitation guidelines provide ambiguous recommendations on co-morbidities in OA patients; whereas the clinician's decision is based on his / her own experience and clinical judgment. We considered it appropriate to analyze the range of diseases most commonly associated with knee osteoarthritis and their possible interventions on kinetotherapeutic program.

The aim of the study. To determine the association pattern of comorbidities in patients with knee osteoarthritis and customized kinetotherapy programs.

Materials and Methods: The present study was based on the re-analysis of previously reported data from the physiotherapist's perspective [19]. The research design is a cross-sectional study, which included 256 consecutive patients with knee osteoarthritis according to R. Altman criteria, 1991 [1]. The study was approved by the Scientific Ethics Committee of the State University of Medicine and Pharmacy "Nicolae Testemiţanu". The selected patients were interviewed for collecting socio-demographic data (age, gender, weight, height, marital status, and level of education). The General Clinical Examination and the Body Mass Index (BMI) have been completed. Radiographic data were collected from the personal health records according to Kellegren-Lawrence classification [2]. Physical activity limitations were analyzed based on the results of Knee Osteoarthritis Outcome Score KOOS, a self-administered questionnaire that includes 5 domains: pain, symptoms, activities of daily living (ADL), sports and recreation (sport/rec) and quality of life (QoL). The intensity of pain was assessed by the 100 mm Visual Analogue Scale (VAS).

The data on concomitant pathologies were collected and analyzed based on clinical examination and personal medical records during the last 12 months until being included in the study. All the diseases were coded according to the International Classification of Diseases, subsequently being grouped into systemic diseases. The Charlson Comorbidity Index has also been applied to determine the impact and severity of the associated pathologies. This index includes the following pathologies: acute myocardial infarction, congestive heart failure, peripheral vascular diseases, cerebrovascular diseases, dementia, chronic pulmonary diseases, connective tissue disease, leukemia, malignant lymphoma, malignant tumor, liver pathology and HIV / AIDS. [6] The total score was calculated online, depending on age.

Statistical analysis of comorbidities, physical activity restrictions, and pain levels were analyzed by descriptive statistics via the MedCalc program.

Results and discussions:

The study group included 256 patients, predominantly females - 196, with a female / male ratio of 3.2: 1, aged between 37 and 81 years. The data show that the onset age ranged from 32 to 80 years (mean age - 54.4 ± 0.6), however, the disease more frequently occurs after the age of 50 due to the presence of other pathologies. Moreover, it is more likely that the associated pathologies will affect the patient's ability to perform physical exercising. The analysis of the KOOS index showed moderate pain intensity ranged between 57,11 ± 19,3%, morning stiffness, and joint creaking in 64,9 ± 16,6% of cases, assessed as the slightest impact on the knee functionality (Figure 1). At the same time, we determined the ADL score of 44.00 ± 22.2%, which results in major difficulties in performing daily activities. Therefore, one-third of the patients said they needed help in carrying out daily activities, such as personal hygiene, dressing, moving and feeding. The results obtained in the field of sports and leisure time showed the lowest score viz. 20.10 ± 22.3%, thus reducing the patient's ability of active leisure, described as one of the most affected areas.

The patient's quality of life, estimated by KOOS, shows a score of 35.07 ± 26.1%. At the same time, we determined that the pain intensity and the reduced joint function directly correlate with the quality of life ($r = 0.5$, $p < 0.001$).

The radiological manifestations of OA were

assessed by the Kellgren-Lawrence classification that showed presence of osteophytes, narrowing and asymmetry of the articular space, subcutaneous sclerotic areas and deformation of bone margins, divided into 4 degrees of severity, which involved: KL I-16 (6.2% KL II-136 (53.1%), KL III-94 (36.7%) and severe KL IV in 10 (3.9%) patients.

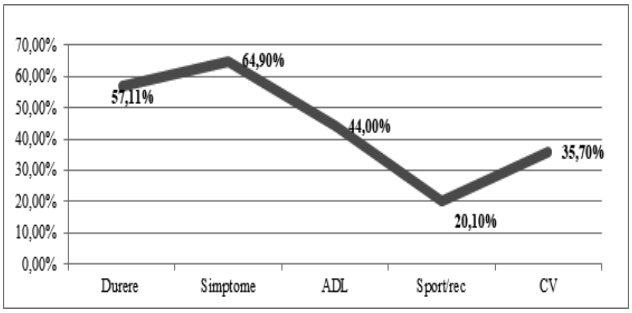

Fig. 1. The knee function according to KOOS score (%)

Note: ADL – activities of daily living; Sport / rec – sports and recreation; QoL – the quality of life.

The relationship between specifically associated disorders was scored by Charlson Comorbidity Index (CCI), which determined the burden and severity of comorbidities. The mean value for the study group was 3.29 ± 0.14, scoring 82.1%, for a survival rate of 1 year and 62.1% for 5 years. There was established a mean correlation between CCI and the absolute number of concomitant diseases ($r = 0.5$, $P < 0.0001$), whilst the disease duration ($r = 0.3$, $P = 0.0002$) and patient age ($r = 0.5$, $P < 0.0001$).

According to the research results the patients with OA commonly have more than one associated disease, thus only one chronic disease was established in 39 patients (15.2%), two and more associated chronic diseases being attested in most patients 61.4% (158 patients), and only 25% of patients presented no concomitant diseases. The mean number of associated pathologies in the study patients was 4.3 ± 0.1 of comorbidities, whereas these pathologies might frequently interfere: OA occurs in patients with hypertension and diabetes mellitus. According to the results, associated pathologies in women were recorded 1.2 times more than in men ($P<0.05$). The presence of more than one pathology might determine the adjustments for the rehabilitation programs. In case of multimorbidity (3 and more associated pathologies), the implementation of kinetotherapy into practice will require both evidence-based decisions and clinical reasoning of the therapist [18].

According to the results of our study, the rate of the most frequent associated pathologies were as following: high blood pressure in 196 (76.6%) patients, followed by obesity, other cardiovascular pathologies (valvular diseases, arrhythmia, ischemic heart disease) and respiratory diseases (chronic bronchitis, bronchial asthma) and diabetes mellitus (Figure 2). Osteoarthritis involved other musculoskeletal impairments besides of the knees [19].

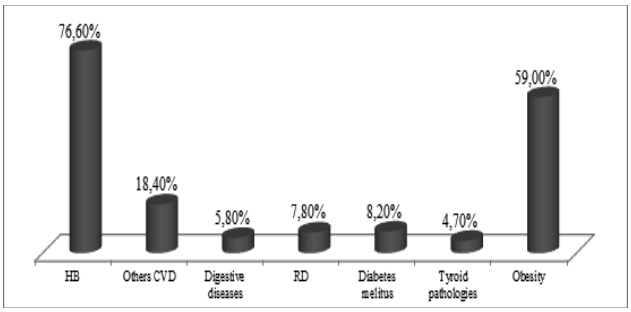

Fig. 2. The frequency of associated pathologies in patients from the study group

Note: HB - hypertension; CVD cardiovascular diseases; RD - respiratory diseases.

In cases of ischemic heart diseases and heart failures (18.4%), physical exercising is restricted due to chest pain, the presence or appearance of heart rhythm disturbances, increased blood pressure, and common symptoms such as dyspnea or syncope, as well as NYHA class III heart failure. Contraindications for starting procedures are as follows: heart rhythm disorders, pericarditis, myocarditis and endocarditis, aortic stenosis, NYHA class IV heart failure, dyspnea at rest, heart failure decompensation, fever, or the first 10 days after a febrile condition [27].

In case of hypertension, the restrictions involve conditions of increased blood pressure

values and ventricular hypertrophy, as well as a decreased aerobic capacity due to the use of beta-blockers and a sedentary lifestyle. Contraindications for physical therapy may also include hypertensive emergencies with systolic blood pressure values of more than 200mmHg or diastolic more than 115mmHg [17].

Diabetes mellitus is a complex pathology that is commonly met in patients with OA and hypertension thus presenting common risk factors. Diabetes was diagnosed in 8.2% of the studied cases. It should be noted that diabetes-diseased patients reported increased VAS pain of 68.7 ± 17.7 mm compared to the non-diabetic group with VAS 65.0 ± 21.0 mm (P= 0.28). Diabetes mellitus is a restriction for kinetotherapy in conditions of hyper- and hypoglycemia, inadequate control of diabetes and the presence of vascular or nerve complications. Literature data highlight only ulcers of the lower limbs as a contraindication for performing classical kinetotherapy [26].

Obesity is considered one of the major risk factor for developing OA, as well as a commonly associated pathology [4], which determines restrictions in kinetotherapy. These are due to dyspnea, inadequate control of thermo-regulation or increased pain in the joints. Overweight persons manifest progression of the disease since the knee joints bear the excessive body weight, which causes the worsening of the lesions and joint functionality. The results show that the BMI patients from the study group were as following: in women 31.6 ± 4.6 kg / m2 (with a varying range 20-40 kg / m2) and in men 29.8 ± 3.9 kg / m2 (with a range 21-39) (P> 0.05). 58.6% , whereas 31.6 % of patients from the study group showed various degrees of obesity and overweight, and only in 9.8 % of cases had a normal body mass index [20].

Both patients with cardiovascular pathology, obesity, and those with diabetes present individual factors for restricting kinetotherapy. These are usually afraid of exercising or show insufficient knowledge of possible kinetotherapy options and lead a sedentary lifestyle. On the other hand, these conditions are also a risk factor for the installation and progression of OA, as well as cardiovascular diseases. In order to interrupt this vicious cycle, the physiotherapist should adapt a treatment approach according to physical deficiencies, psychological and behavioral disorders of the patient.

Regarding the other systems, respiratory disorders were found in 7.8% of patients. Restricted physical exercise was also due to some personal reasons, such as fear of exercising, dyspnea, insufficient knowledge about the complex and a better control of asthma, as well as the sedentary lifestyle [7]. Other contraindications may also include pneumonia and a weight loss over 10% during the last 6 months, or 5% in the last month [10].

The symptom of chronic pain was also determined by the impairment of other joints during the inflammatory process, namely: hip OA in 57 of the patients (22.3%), OA of the hand in 54 cases (21.1%), osteochondrosis of the spine in 24 (9, 4%) cases and osteoarthritis of other regions - 28 (10.9%). Although chronic pain is not a contraindication to exercises, however, it may result in a reduced pain tolerance, increased algal syndrome and/or fatigue during and after kinetotherapy or home exercise sessions. Obesity causes restrictions for physical therapy, resulting from physical deficiencies, structure or functions, as well as psychological disorders and behavioral problems [15].

Based on the obtained results, we determined the restriction cases for those that require a personalized set of kinetotherapeutic exercises (Table 1). Data analysis indicated contraindications for classical kinetotherapy in 20 (10.1%) of patients with comorbidities out of 197 cases. Restrictions were mainly caused by structural and individual factors, and only 8 patients presented environmental impairments (such as hearing and vision disorders).

Additionally, cardiovascular pathology, diabetes, respiratory and musculoskeletal diseases

cause some restrictions related to the structure and function of organs involved in the pathological process, thus developing customized physical therapy programs. Furthermore, chronic pain syndrome and depression cause psychological and behavioral limitations. Visual or hearing disorders caused environmental impairments, thus kinetotherapy sessions were quite problematic and required a restricted individual program under house conditions. Data from the published literature indicate that kinetotherapy is difficult or even impossible [18].

Conclusions:

The study results have identified the relationship between knee osteoarthritis and cardiovascular diseases, obesity, respiratory diseases, diabetes mellitus and others pathologies. Some specific conditions determine increased pain levels and/or moderate / severe joint functional limitations. It has been found that comorbidities determined the application of the individualized kinetotherapy programs along with the already existing contraindications for physical exercising. Rehabilitation programs for patients with knee osteoarthritis should include individualized kinetotherapeutic programs, which must be adapted to the associated conditions of each patient.

Table 1. Comorbidities and physiotherapeutic restrictions in patients from the study group (n = 197)

Diseases	Total No.	Restrictions			Contraindications No. (%)
		Structure No. (%)	Psychosocial or behavior No. (%)	Environmental No. (%)	
Hypertension	196	98 (50,0)	124 (24,3)	2 (1,02)	2 (1,02)
Ischemic heart diseases and heart failure	47	46 (97,8)	27 (57,4)	1 (2,1)	7 (14,9)
Diabetes mellitus	21	6 (28,6)	17 (80,9)	1 (4,7)	0 (0)
Respiratory diseases	20	2 (10)	1 (5)	0 (0)	0 (0)
Digestive diseases	15	3 (20)	0 (0)	0 (0)	0 (0)
Thyroidal pathologies	12	8 (66,7)	2 (16,7)	0 (0)	0 (0)
Obesity	151	68 (45,0)	74 (49,0)	2 (1,3)	10 (6,6)
Chronic pain	89	19 (21,3)	17 (19,1)	1 (1,1)	1 (1,1)
Hearing and or visual disorders	6	2 (33,3)	1 (16,6)	6 (100)	0 (0)

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