

## STATISTICAL CHARACTERISTICS OF GROUPS OF ELDERLY PATIENTS WITH GONARTHROSIS AGAINST THE BACKGROUND OF OVERWEIGHT OR OBESITY

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### ABSTRACT

**Background.** The aging of the population, the prevalence of gonarthrosis, and the epidemic of overweight highlight the relevance of the study.

**Aim.** To determine the effectiveness of the treatment algorithm for persons of older age groups with gonarthrosis of the II–III degree and functional insufficiency of the I–II degree, excessive body weight in the conditions of martial law by means of statistical processing of the obtained results.

**Materials and Methods.** The study continued during 2022–2025 in the polyclinic of the Municipal Non-Profit Enterprise of the Kharkiv Regional Council "Regional Clinical Hospital". 100 older patients with gonarthrosis of II–III degree and functional insufficiency of I–II degree, and overweight, who were divided into three groups according to treatment tactics, were examined. Group I and Group II patients received oral chondroprotectors and used articulated orthoses. After 3 months, patients of Group I were injected with hyaluronic acid intra-articularly during a follow-up examination. Patients in all groups received topical and oral non-steroidal anti-inflammatory drugs. All patients signed a consent to participate in the study. Statistical processing of the Lequesne index and Western Ontario & McMaster Universities Osteoarthritis index was carried out using SPSS 27 (IBM, USA).

**Results and Conclusions.** According to the Kolmogorov-Smirnov criterion, the normal distribution of the studied indicators was confirmed. Combined treatment of patients of Group I (orthoses, chondroprotectors and hyaluronic acid) proved to be statistically and clinically effective in older patients with gonarthrosis of II–III degree and functional insufficiency of I–II degree against the background of overweight. Group II patients needed further optimization of treatment, and Group III – active intervention. The results obtained were similar to some foreign and domestic studies.

**Keywords:** *degenerative-dystrophic diseases, body mass index, Lequesne index, Western Ontario & McMaster Universities Osteoarthritis index.*

### Introduction

The aging of the population is illustrated by the balance between age groups under 5 and over 65 years of age, which is steadily shifting towards older age groups [1–3].

According to many researchers, we are observing an increase in the share of degenerative-dystrophic diseases, among which lesions of the

lower extremities predominate, and the knee joint is most often affected. Pronounced debilitating pain syndrome with impaired function of the knee joint, and impaired statics and dynamics of gait reduce the quality of life and can lead to loss of social adaptation and disability in the category of patients older than 55 years. All this, together with an increase in the number of people with excess body weight and obesity, leads to the prevalence of degenerative-dystrophic diseases in the world in general and in Ukraine in particular [4–6].

Taking into account the military situation in Ukraine, the question arose about the possibility of treating elderly patients with gonarthrosis against the background of overweight and obesity to improve the quality of life and increase func-

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tional capabilities. To control the dynamics of the results, an observation map was developed using questionnaires based on the Visual Analogue (pain) Scale (VAS), Lequesne indexes and the Western Ontario & McMaster Universities Osteoarthritis index (WOMAC), and measurements of movement volumes, joint girth, weight, and the displacement test. To verify the obtained indicators, it was decided to check them statistically.

The **aim** of study was to determine the effectiveness of the treatment algorithm for persons of older age groups with gonarthrosis of the II–III degree and functional insufficiency of the I–II degree, excessive body weight in the conditions of martial law by means of statistical processing of the obtained results.

### Materials and Methods

The study continued during 01.2022–04.2025 in the polyclinic of the Municipal Non-Profit Enterprise of the Kharkiv Regional Council "Regional Clinical Hospital". 100 older patients with gonarthrosis of II–III degree and functional insufficiency of I–II degree, and overweight, who were divided into three groups according to treatment tactics, were examined. Women accounted for 60% among all patients.

Group I and Group II patients received oral chondroprotectors and used articulated orthoses. After 3 months, patients of Group I were injected with hyaluronic acid intra-articularly during a follow-up examination. Patients in all groups received topical and oral non-steroidal anti-inflammatory drugs.

General criteria for inclusion in the groups: age over 65 years, gonarthrosis II–III degree, body mass index greater than 25 kg/m<sup>2</sup>. Indicators during examinations (initial, after 3, 6 and 12 months) were studied. For data analysis, a consolidated table was created, which was filled out during examinations, consisting of 17 columns and 4 lines for each patient. Each patient was assigned a code: the first Roman numeral indicated the group, and the second number was the patient's ID within the group (from 1 to 30 in the Group I and Group II; and from 1 to 40 – in the Group III), during examinations the following parameters were entered: age (years, months), sex, weight (kg), height (m), amplitude of movements in the knee joint during flexion and extension in degrees, girth knee joint in cm; use of orthoses, visual analog scale questionnaire data, Lequesne index, Western Ontario and McMaster University Osteoarthritis Severity Index (WOMAC), and physical activity.

In addition, clinical data were entered into the consolidated table with the code M17 and clarification of the diagnosis of II–III gonarthrosis with functional insufficiency of the joint I–II degree, disturbance of statics and dynamics of gait, overweight or obesity, indicating the degrees according to the International Classification of Diseases of the 10<sup>th</sup> revision.

The criteria for inclusion in a certain group are treatment tactics, namely: the use of orthoses and chondroprotectors in the I and II groups, intra-articular injection of hyaluronic acid only in the I group.

All patients signed a consent to participate in the study. Statistical processing of the Lequesne index and Western Ontario & McMaster Universities Osteoarthritis index was carried out using SPSS 27 (IBM, USA).

### Results and Discussion

To check the normality of data distribution, the Kolmogorov-Smirnov test was used, which confirmed the normal distribution of the studied indicators.

The groups were compared and the following results were obtained: in the Group I, the **WOMAC index** at the initial reception was on average  $M=49.43\pm0.504$ , after 3 months this indicator was  $M=43.07\pm3.581$ , after 6 months after the start of treatment this indicator changed to  $M=38.20\pm\pm3.718$ , and after 12 months –  $M=30.13\pm1.852$ ; in Group II, the WOMAC index at the initial reception was on average  $M=49.43\pm0.504$ , after 3 months this indicator was  $M=44.67\pm2.998$ , after 6 months after the start of treatment this indicator changed to  $M=40.73\pm4.127$ , and after 12 months –  $M=31.27\pm1.999$ ; in Group III, the WOMAC index at the initial reception was on average  $M=50.13\pm4.708$ , after 3 months this indicator was  $M=45.78\pm2.577$ , after 6 months after the start of treatment this indicator changed to  $M=42.85\pm\pm2.424$ , and after 12 months –  $M=40.05\pm1.319$ .

The average Lequesne index in Group I at the initial reception was on average  $M=13.30\pm0.596$ , after 3 months this indicator was  $M=11.73\pm0.521$ , after 6 months after the start of treatment this indicator changed to  $M=10.93\pm0.640$ , and after 12 months –  $M=7.40\pm0.498$ ; in Group II the index at the initial reception was  $M=13.30\pm0.596$ , after 3 months this indicator was  $M=11.83\pm0.461$ , after 6 months after the start of treatment this indicator changed to  $M=11.17\pm0.379$ , and after 12 months –  $M=9.87\pm0.860$ ; in Group III the Lequesne index at the initial reception was  $M=13.28\pm0.554$ ,

after 3 months this indicator was  $M=11.93\pm0.35$ , after 6 months after the start of treatment this indicator changed to  $M=11.28\pm0.452$ , and after 12 months –  $M=11.23\pm0.423$ .

To compare the mean values between two dependent samples, the Student's t-test was used, which allows you to determine whether there is a statistically significant difference between the mean values of two groups. This method is based on the assumption of a normal distribution of samples and approximate equality of variances, and is one of the most common ways of analyzing differences between groups in biomedical research. It is a reliable statistical method for analyzing differences between independent samples in medical research, provided the necessary assumptions are met. Its use allows evaluating the effectiveness of interventions and facilitates evidence-based clinical decision-making.

Levene's test is used to test the hypothesis of equality (homogeneity) of variances in two or more samples. This test is important when using the Student's t-test for independent samples, since the classical t-test assumes equal variances in the compared groups [8; 9].

The results of treatment were evaluated dynamically during control examinations in groups I and II and retrospectively according to the data entered in the outpatient cards of Group III.

Using the Student's t-test, independent samples were compared in the context of medical research. The Student's t-test for independent samples is used to test the null hypothesis that the mean values of the general populations are equal based on the sample data.

From the results obtained when comparing the studied groups, it can be seen that during the initial examination, the first and Group II according to the WOMAC index have  $M=49.43\pm0.504$ , the Group III – the WOMAC index has  $M=50.13\pm4.708$ . The difference is statistically significant between Group I and Group III, and between Group II and Group III ( $p\leq0.05$ ). However, there is no difference in means between Group I and Group II. Levene's test for equality of variances indicates that the variance of the WOMAC index in all groups does not differ statistically significantly ( $p=0.249$ ) according to the initial examination indicator, therefore, the use of the t-test is correct.

A similar situation was observed during the follow-up examination after 3 months according to the WOMAC index, where Group I and Group II had  $M=43.07\pm3.581$ , and Group III –  $M=$

$=45.78\pm2.577$ . There is no difference between the Group I and Group II. Levene's criterion of equality of variances indicates that the variances in the groups do not differ statistically significantly ( $p=0.512$ ).

When comparing the Group I and Group III, significant average differences were found in the indicators for the follow-up examination 6 months after the start of observation according to the WOMAC index: in Group I,  $M=38.20\pm3.718$ , in Group III –  $M=42.85\pm2.424$  ( $p\leq0.001$ ), according to Levene's criterion, variances do not differ significantly ( $p=0.645$ ); the Lequesne index in Group I  $M=10.93\pm0.640$ , in Group III –  $M=11.28\pm0.452$  ( $p\leq0.050$ ), according to Levene's criterion, the variances do not differ significantly ( $p=0.160$ ). During the follow-up examination after 12 months: according to the WOMAC index in Group I  $M=30.13\pm1.852$ , in Group III –  $M=40.05\pm1.319$  ( $p\leq0.001$ ), according to Levene's criterion, variances do not differ significantly ( $p=0.073$ ); Lequesne index where in the Group I  $M=7.40\pm0.498$ , in Group III –  $M=11.23\pm0.423$  ( $p\leq0.001$ ), according to Levene's test, the variances do not differ significantly ( $p=0.085$ ).

When comparing patients Group I and Group II, significant average differences were found in the indicators during the examination after 6 months: the WOMAC index in Group I was  $M=38.20\pm3.718$ , in Group II –  $M=40.73\pm4.127$  ( $p\leq0.05$ ), according to Levene's criterion, variances do not differ significantly ( $p=0.516$ ). After 12 months, the WOMAC index in Group I was  $M=30.13\pm1.852$ , in Group II –  $M=31.27\pm1.999$  ( $p\leq0.05$ ), according to Levene's criterion, variances do not differ significantly ( $p=0.316$ ); the Lequesne index in the Group I was  $M=7.40\pm0.498$ , in Group II –  $M=9.87\pm0.860$  ( $p\leq0.001$ ), according to Levene's criterion, the variances do not differ significantly ( $p=0.269$ ).

When comparing Group II and Group III, significant differences in averages were found: in the indicators after 6 months, the WOMAC index in Group II was  $M=40.73\pm4.127$ , in Group III –  $M=42.85\pm2.424$  ( $p\leq0.05$ ), according to Levene's criterion, the variances do not differ significantly ( $p=0.076$ ). After 12 months, the WOMAC index in Group II was  $M=31.27\pm1.999$ , in Group III –  $M=40.05\pm1.319$  ( $p\leq0.001$ ), according to Levene's criterion, variances do not differ significantly ( $p=0.103$ ); the Lequesne index in Group II was  $M=9.87\pm0.860$ , in Group III –  $M=11.23\pm0.423$  ( $p\leq0.001$ ), according to Levene's test, the variances do not differ significantly ( $p=0.084$ ).

Therefore, from the performed therapy, according to the Leken and WOMAC indices, we have a verified improvement in the patient's condition, more pronounced in the Group I and moderate in the Group II.

Therefore, throughout the observation period, group I demonstrated better results according to the WOMAC and Leken indices compared to Group II and Group III. Significant improvements were already observed after 6 months (WOMAC:  $38.20 \pm 3.718$ ) and significantly increased up to 12 months (WOMAC:  $30.13 \pm 1.852$ ; Leken:  $7.40 \pm 0.498$ ). In Group II, the results were better than in Group III, but worse than in Group I. Statistically significant differences with Group III confirm the effectiveness of therapy (WOMAC:  $31.27 \pm 1.999$  vs.  $40.05 \pm 1.319$  at 12 months,  $p \leq 0.001$ ). In all cases, the homogeneity of variances was tested according to Levene's test ( $p > 0.05$ ), which provides grounds for the correct use of the Student's t-test. Significant differences between groups confirm the hypothesis about the effectiveness of treatment in the Group I.

The obtained results of the study confirm the effectiveness of targeted treatment in the elderly, which meets the needs of patients in the context of the global increase in morbidity. The use of combined therapy in the Group I (orthoses, chondroprotectors, hyaluronic acid) was clinically effective. This is confirmed by World Health Organization data, which emphasizes the importance of a comprehensive approach in the treatment of osteoarthritis of the knee joint, including pharmacological and non-pharmacological methods [1].

The obtained results are consistent with the study of Lementowski P.W. & Zelicof S.B., who prove that excess weight increases the risk and progression of gonarthrosis due to additional mechanical load on the joints [4].

According to Long H. et al. (2022), the prevalence of gonarthrosis is steadily increasing, especially among the elderly, which is associated with

global demographic changes and the obesity epidemic [3].

Osadchuk T.I. et al. demonstrates similar results regarding the effectiveness of differentiated approaches to the treatment of gonarthrosis in Ukraine [7].

Thus, the research data convincingly demonstrate the effectiveness of a multifactorial approach in the treatment of gonarthrosis, especially in patients with accompanying obesity, which is consistent with current international and national recommendations.

### Conclusions

1. The combined treatment of Group I (orthoses, chondroprotectors and hyaluronic acid) was statistically and clinically effective in older patients with II–III degree gonarthrosis and I–II functional insufficiency against the background of excess weight.

2. Group II requires further optimization of treatment, and Group III requires active intervention.

3. The obtained results are similar to similar foreign and domestic studies due to timely diagnosis, correctly selected conservative treatment of elderly and venerable patients, and regardless of the nuances of military status.

### DECLARATIONS:

#### Disclosure Statement

The authors have no potential conflicts of interest to disclosure, including specific financial interests, relationships, and/or affiliations relevant to the subject matter or materials included.

#### Statement of Ethics

The authors have no ethical conflicts to disclosure.

#### Data Transparency

The data can be requested from the authors.

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#### Consent for publication

All authors give their consent to publication.

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