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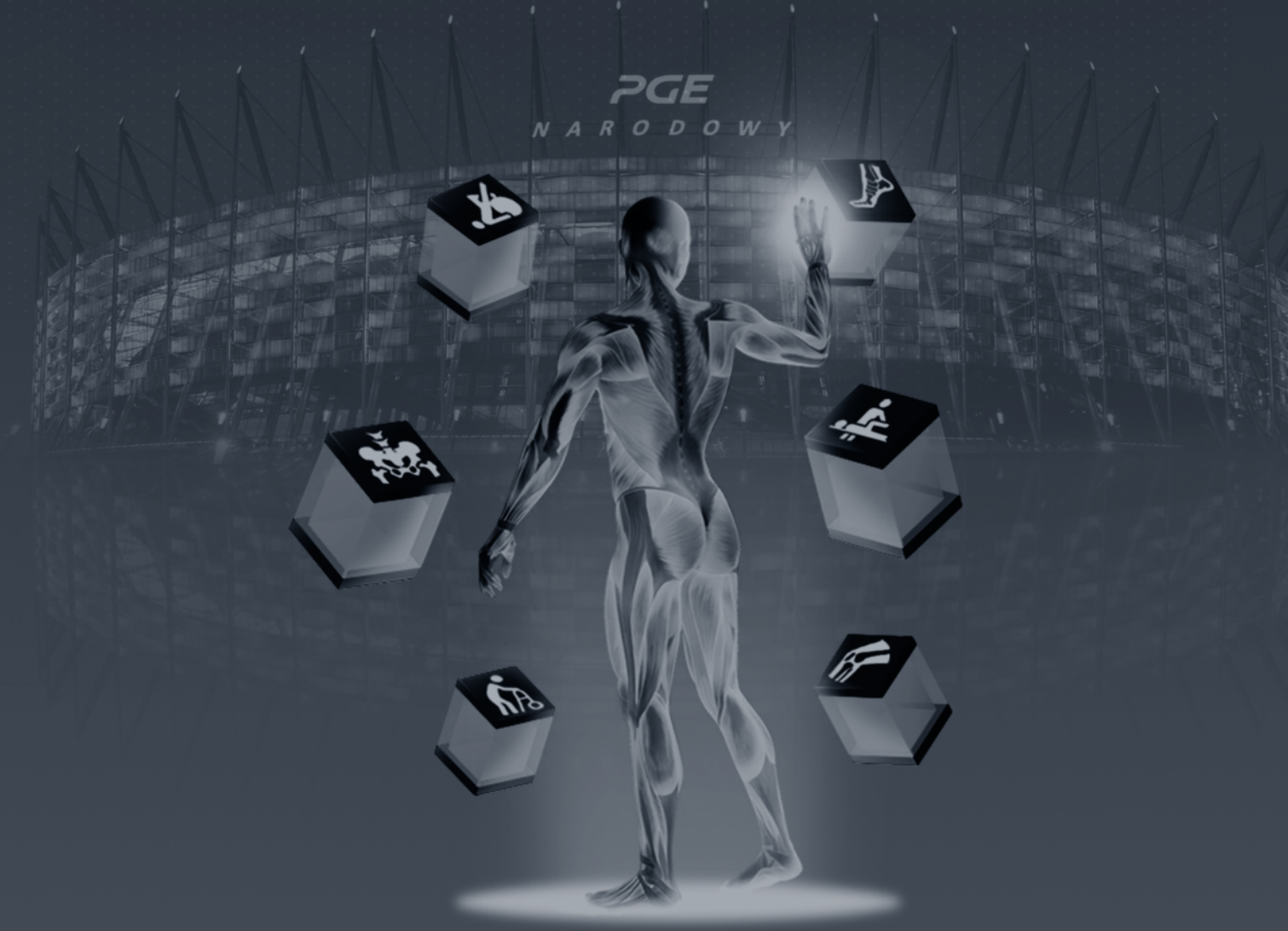

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The evaluation of the effectiveness of a cryotherapy treatment in patients with gonarthrosis

Ocena skuteczności zabiegu krioterapii u pacjentów z chorobą zwyrodnieniową stawu kolanowego

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Abstract

The purpose of the study. The purpose of this study is to describe the results of the research on the patients' evaluation regarding complaints and difficulties in their daily life, as well as on the assessment of their general health condition in terms of the rehabilitation of gonarthrosis before and after physiotherapy treatments, with and without the use of cryotherapy.

Materials and methods. The research was carried out with the use of a survey questionnaire on a group of 40 patients. Each patient experienced osteoarthritis in at least one knee joint. The questionnaire consisted of questions related to the type of complaints and functioning difficulties in patients with gonarthrosis before and after rehabilitation, and to the type of performed treatments with emphasis put on cryotherapy and the assessment of general health improvement in patients after rehabilitation.

Conclusions. According to the patients participating in the research, the improvement in rehabilitation of gonarthrosis with cryotherapy treatments is not greater than with other physiotherapy treatments.

Key words:

Cryotherapy, cold therapy, gonarthrosis

Streszczenie

Cel pracy. Celem pracy jest opisanie wyników badania oceny pacjentów w zakresie występowania dolegliwości oraz utrudnień w życiu codziennym oraz ogólnego stanu zdrowia w kontekście usprawniania w chorobie zwyrodnieniowej stawów kolanowych przed i po przeprowadzeniu zabiegów fizjoterapii z użyciem krioterapii i bez jej użycia.

Materiał i metodyka. Badania przeprowadzono, wykorzystując kwestionariusz ankiety na 40-osobowej grupie, w której u każdego pacjenta występowała choroba zwyrodnieniowa przynajmniej jednego stawu kolanowego. Zawarte w nim pytania dotyczyły rodzaju dolegliwości i utrudnień w funkcjonowaniu występujących u pacjentów w związku z chorobą zwyrodnieniową stawu kolanowego przed procesem rehabilitacji i po nim, rodzajem otrzymanych zabiegów z uwzględnieniem krioterapii oraz z oceny ogólnej poprawy stanu zdrowia po usprawnianiu.

Wnioski. Zabiegi krioterapii w odczuciu uczestniczących w badaniu pacjentów nie przynoszą większej poprawy w usprawnianiu przy chorobie zwyrodnieniowej stawu kolanowego niż inne zabiegi z zakresu fizjoterapii.

Słowa kluczowe:

krioterapia, zimnolecznictwo, choroba zwyrodnieniowa stawu kolanowego

Introduction

Increasing number of older persons in developed countries makes osteoarthritis a significant social problem [1]. It is the most common joint disease and cause of impairment [2, 3]. It is diagnosed in a growing part of population. According to the Polish Central Statistical Office [Główny Urząd Statystyczny] research, osteoarthritis is ranked fifth in terms of the most frequent disease entities in adult persons in Poland. It manifests not only in older persons, but also in a younger part of a society. The tendency to its occurrence and development, however, increases with age. Starting with the age bracket of 30-39, affected persons account for 1.1%, while in the age bracket of 50-59, 18.9% of persons report complaints. The highest morbidity rate is noted in persons at the age of over 80, and it reaches 52% of this group [4].

Osteoarthritis concerns structural changes within joints. The number of chondrocytes is decreased due to the deterioration of their metabolic processes. The prevalent symptom is pain, initially during excessive joint strain, that recedes after rest. Morning stiffness occurs as a result of a long period of no physical activity, however, it recedes after several movements. Pathological changes initially occur within a joint cartilage. It becomes thinner, and a disease process starts to affect next tissues. As a result, a joint deformation occurs due to swollen and inflamed joint capsule, and osteophyte formation occurs. The deformations cause distortion, restricted mobility, thickening of joint outlines [3]. Joints that are the most frequently affected by osteoarthritis are knee joints. The atrophy of vastus medialis might be considered as the first symptom of the development of pathology before more intense symptoms occur. Along with the increase in complaints, patients aim to comfortably arrange their bodies, i.e. lower limb slightly bent in a knee joint. Due to the fact that the muscle becomes active in the last extension phase of movement, it rapidly becomes to decline [5]. The most common causes of gonarthrosis include obesity, lack of physical activity, or on the contrary – excess physical activity, microtraumas, manual job, bad posture [1, 2].

The aim of physiotherapy in such cases is to restore functional ability to the most possible extent. Physical therapy is performed as a preparation for exercises or independently as a treatment with an analgesic effect. Due to kinesiotherapy, a joint cartilage becomes nourished which allows for a normal or increased range of motion [2]. Knee joint, by reason of its localization in a human body and anatomy is easily accessible and vulnerable to physical stimuli. It consist of the femur, tibia, and patella [6, 7]. There are numerous blood vessels and soft tissues around the joint, including i.a. muscles: sartorius muscle, gracilis muscle, quadriceps femoris muscle, articularis genus muscle (it forms the deepest layer of the vastus intermedius), semimembranosus muscle, semitendinosus muscle, biceps femoris muscle, and gastrocnemius muscle [6]. Therefore, this may result in the joint-region hyperaemia and the induction of its movement. One of the recommended treatments in the process of rehabilitation of gonarthrosis is cryotherapy. It uses materials of a significantly lower temperature than of a human body. Gas might be used as an

example of such substance. The use of gas causes the contraction of tissues being treated. Subsequently, surface tissues receive the increased amount of blood, and muscle tension decreases [8].
Due to the fact that the occurrence of osteoarthritis is more and more common, it is significant to carry out research on the patients' evaluation regarding the impact of particular physical treatments on the process of rehabilitation. Carried out research and further presented results concern the use of cryotherapy in the case of changes in knee joints.

Purpose of the study

The purpose of this study is to describe the results of the research on the patients' evaluation regarding complaints and difficulties in their daily life, as well as on the assessment of their general health condition in terms of the rehabilitation of gonarthrosis before and after physiotherapy treatments, with and without the use of cryotherapy. The answers to the following questions should be considered as the detailed purposes of the study:
1. In comparison to the patients who underwent physiotherapy treatments without the use of cold therapy, do the physiotherapy treatments with the use of cryotherapy improve the general health condition of patients in their own opinion and if so, to what extent?
2. Were the physiotherapy treatments with the use of cryotherapy in patients more effective in terms of the decrease in complaints and functioning difficulties than in patients who underwent treatments without the use of cold therapy?

Materials and methods

As it was stated before, the causes of the occurrence and development of gonarthrosis might be numerous. Part of them – a patient's type of work and weight, might have a direct impact on the course of disorder. Patients who perform manual job are more liable to degenerative changes in joints, including lower limb joints, than office workers. Thus, joint strain resulting from weight is a significant factor in the discussed scope. Age and gender have a significant impact as well. Along with the aging process, the natural wear of a human body increases, and metabolic processes decrease. It directly develops predisposition to the occurrence of degenerative changes in joints. Moreover, gender is also significant in this process. These types of disease entities develop more frequently in women than in men. In the carried out research, the group of patients was asked about the abovementioned parameters in order to assess the potential for further development of changes. A survey questionnaire was used for the purposes of this research.
The research group consisted of 40 patients, 88% of whom were constituted by women (35 patients), and 12% by men. Each patient was diagnosed with gonarthrosis. In the research, no distinction was made between patients with one-knee changes and both limbs changes. A total of 80% of patients did not engage in any professional activity. Most of the patients (25 patients) were at the age of over 70. The rest of the patients (7 patients) were at the age of 60-69. Only one patient, at the age of 50-59, was unemployed. A total of 18%

of the research group was constituted by professionally active patients, and 3 of them were office workers. Each of these patients represented a different age bracket. In the research, more patients were performing manual job. They constituted 10% of the research group, and 56% of the professionally active patients (Table 1). The patients' answers to the question related to the dominant nature of work performed for most of their life, showed that 25 of them performed manual job, and the rest of them were office workers.

Table 1. A quantitative summary of patients from the research group, divided on the basis of age brackets and type of performed professional activity

Age brackets [year of age]	Office work	Manual job	Unemployed	Retirement or disablement
to 18	0	0	0	0
19–29	0	0	0	0
30–39	1	0	0	0
40–49	0	1	0	0
50–59	1	3	1	0
60–69	1	0	0	7
over 70	0	0	0	25

Source: own research

Table 2. A quantitative summary of patients from the research group, divided on the basis of age brackets and weight according to BMI

Age brackets [year of age]	Underweight	Normal weight	Overweight	Class I obesity	Class II obesity	Class III obesity
to 18	0	0	0	0	0	0
19–29	0	0	0	0	0	0
30–39	0	0	1	0	0	0
40–49	0	1	0	0	0	0
50–59	0	0	3	2	0	0
60–69	0	1	6	1	0	0
over 70	0	22	3	0	0	0

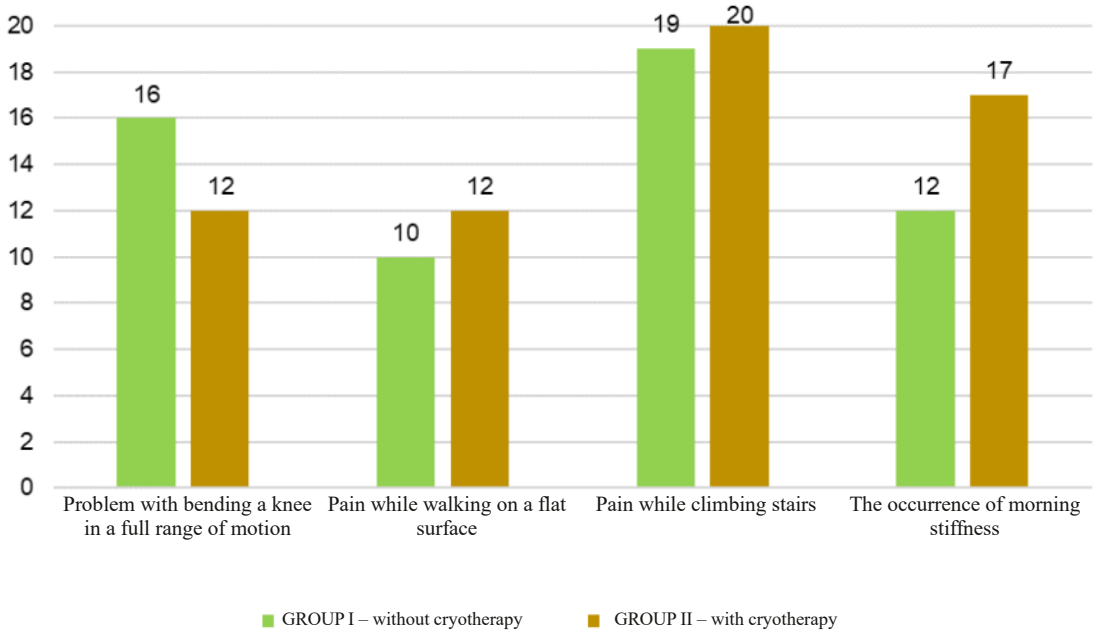
Source: own research

In the particulars field that was a part of the questionnaire, the patients were asked to provide their body weight and height. On the basis of these parameters, BMI was calculated and used for determining normal and abnormal body weight of the patients. Among 40 respondents, 60% (24 patients) were within a normal range of weight, and the rest of them had an abnormal body weight. Most of the group of 16 patients – 81% were overweight, and 19%

were obese (class I). None of the patients was underweight, obese (class II), and obese (class III). Apart from the age brackets of 30-39 and 40-49, that were represented by only one patient each, the highest percentage of patients with a normal weight was in the group of patients at the age of over 70 – 88%. The lowest percentage, however, was in the group of patients at the age of 50-59 and totalled 0%. In the group consisted of subgroups constituted by more than one patient, 100% of patients were overweight (60%) or obese (class I) (40%). Similar values were presented in the age brackets of 60-69. In this case, a total of 88% of patients had an excessive body weight. All things considered, a normal body weight was most frequent in the patients in age brackets of over 70.

The results of the research

In the survey research carried out on the group of 40 patients, the evaluation of the effectiveness of cryotherapy treatment in patients with gonarthrosis was made. It was achieved by assigning patients who were undergoing a 10-day rehabilitation to the research group – part of them was treated with a set of treatments without cryotherapy, and the other part with the use of cryotherapy. In this regard, both subgroups were equal and consisted of 20 patients each. The whole research group had a 6-months rehabilitation stay. During this period, the results were being collected by means of survey questionnaires. The patients were asked about their complaints and difficulties in their daily life that resulted from gonarthrosis. The questions concerned the period before and after the rehabilitation. As a result, two data sets were collected for the purpose of the comparison of the patients' evaluation in terms of the effectiveness of cryotherapy. Subsequently, the patients answered the question about their general health improvement in terms of the treated disease entity. The results differentiate between the subgroups on the basis of applied set of treatments.



All figures – Source: own research

Figure 1. A quantitative distribution of patients from the research group on the basis of complaints before the rehabilitation.

In terms of complaints related to the disease in question that occur before the rehabilitation, four answers were available to choose from (with the possibility of choosing multiple answers). The research group, consisted of 40 patients, indicated a total of 118 answers. Patients who underwent the cryotherapy treatment chose 61 answers, and patients who were not treated with cryotherapy chose 58 answers. Therefore, both subgroups faced similar generalized level of complaints related to gonarthrosis. A problem with bending a knee in a full range of motion was more frequently chosen by patients who did not undergo a cold therapy. The proportion of their choices was 57% to 43%. Three alternative types of complaints were more frequently chosen by patients who underwent the rehabilitation with the use of cryotherapy. However, there was a significant difference noticed in the answers on morning joint stiffness. The proportion was 59% to 41% (Figure 1). There was no patient in the whole research group who did not choose at least one answer, while over a half of the research group decided on three answers.

Among the difficulties in daily life, the possible answers were connected to: climbing stairs, getting up, maintaining personal hygiene and shopping. The answers of the research group totalled 72 as the patients were allowed to choose multiple answers. 37 of the answers were provided by the subgroup of patients who underwent the rehabilitation without the use of cold therapy. The remaining 35 answers were provided by the subgroup of patients after cryotherapy treatments. In respect of differences between the number of answers to particular questions provided by patients divided into two groups, it is important to empha-

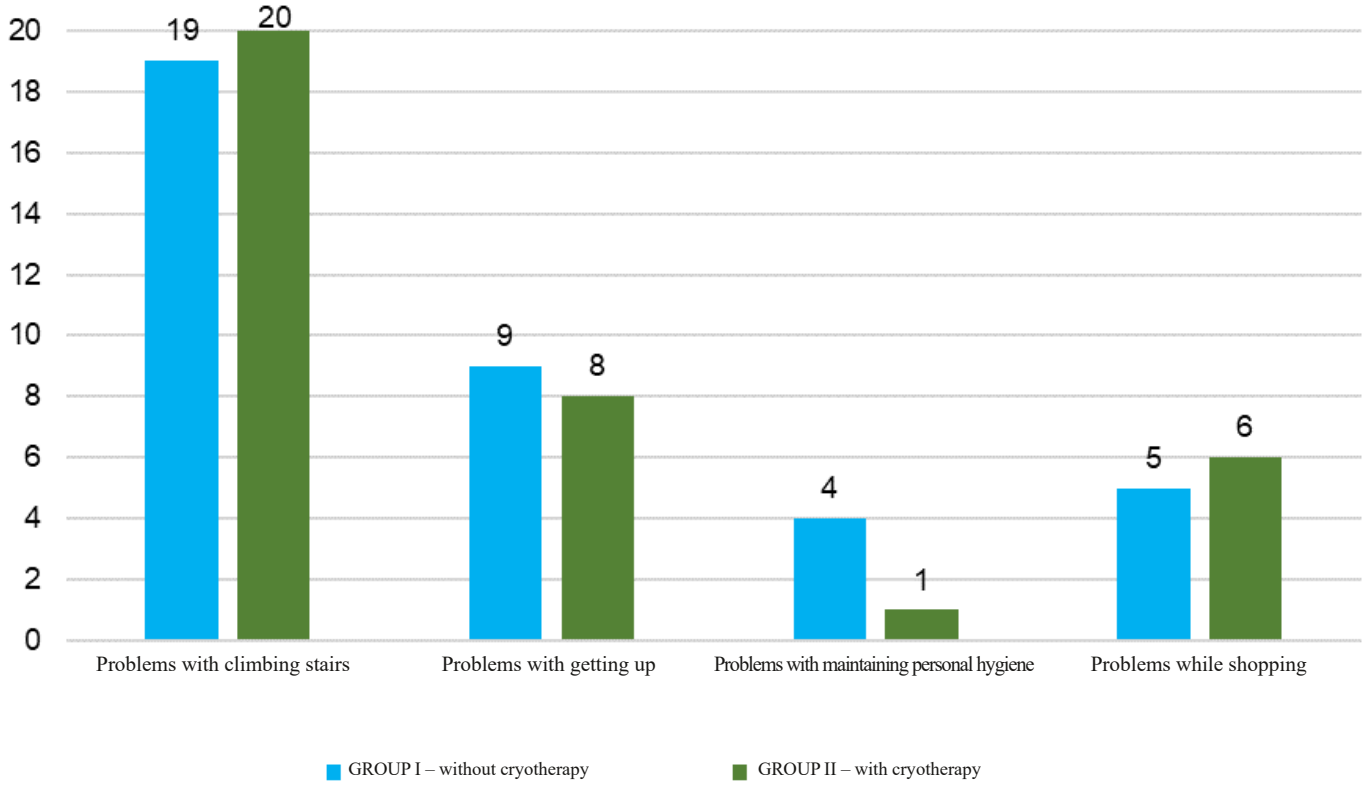


Figure 2. A quantitative distribution of patients from the research group on the basis of difficulties in their daily life before the rehabilitation

size the fact that there were no significant differences. It particularly referred to three answers. In the case of problems with maintaining personal hygiene, which was the least frequently chosen answer by both of the groups (with/without cryotherapy), the greatest difference in a nominal value occurred, and the proportion was 75% to 25%. About 40% of patients chose only one answer while the average number of answers per one patient was 1.8 (Figure 2).

Patients from the research group who underwent the rehabilitation expressed their opinion on the complaints and difficulties in their daily life. In the case of the first scope, the number of answers totalled 86. It is 27% less than before treatments. It means that there was the decrease in complaints due to the treatment. Patients, who did not undergo cold therapy, before treatments indicated 57 answers about various complaints. After the rehabilitation, the number of answers totalled 40, which is 30% less. Cognately, in the case of physiotherapy with the use of cryotherapy, there was the decrease in complaints by 25%, which is 15 answers less (from 61 to 46). Pain while climbing stairs before the treatment was chosen by the biggest number of patients – 19 answers in the group I and 20 answers in the group II. After the therapy, the number of answers decreased by 21% (from 19 to 15) and by 30% (from 20 to 14). No change of results was noticed in the case of the occurrence of pain while walking on a flat surface. However, significant differences were pointed out in terms of answers related to the problem with bending a knee in a full range of motion and the occurrence of morning stiffness. In the first case, the decrease in the number of answers after the rehabilitation totalled 38% in the group I and 33% in the group II. After the treatment, morning stiffness in patients was reduced by 58% in the group without cryotherapy and 29% in the group with cold therapy applied (Figure 1 and 3).

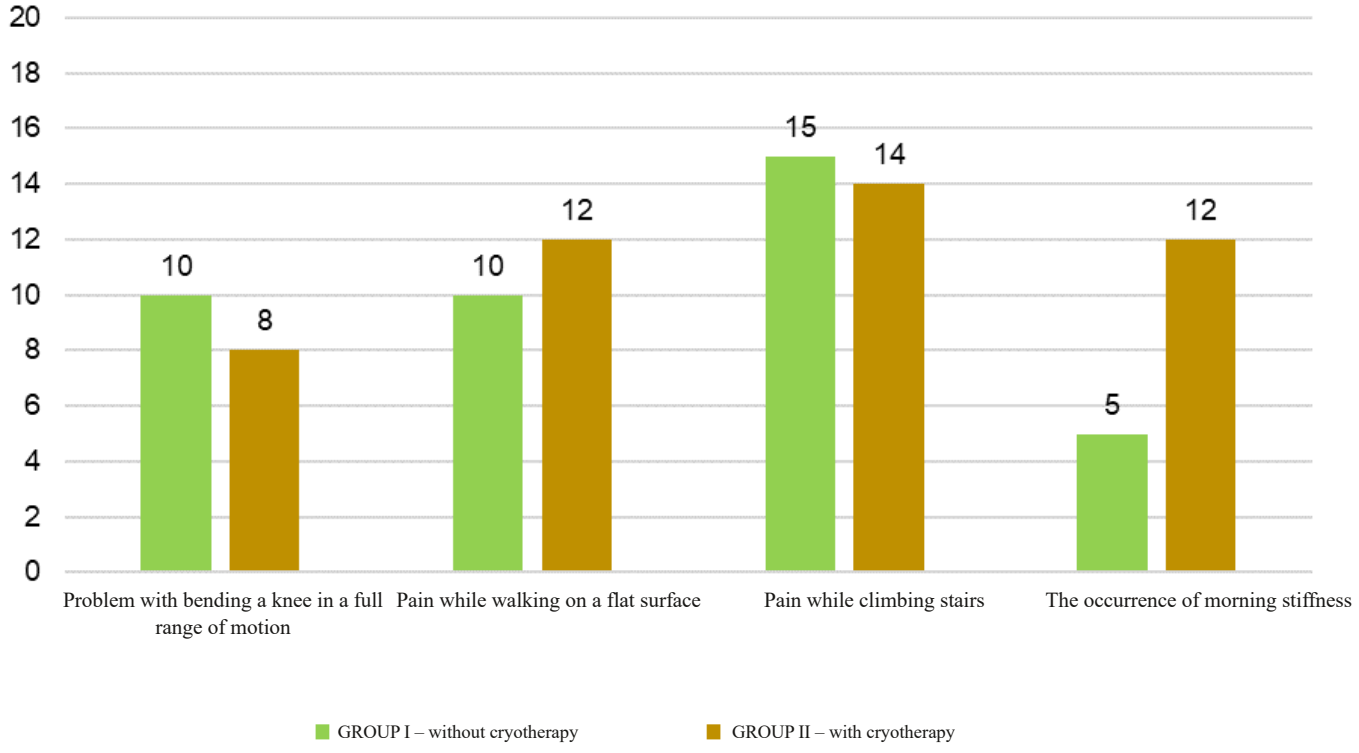


Figure 3. A quantitative distribution of patients from the research group on the basis of complaints after the rehabilitation

In terms of the difficulties in daily life, the number of answers provided by patients after the rehabilitation was lower. Altogether there were 59 answers against previous 72, which is 18% less. It means that there was the improvement of the health condition of patients in their own opinion. At the same time, the improvement and decrease in functioning difficulties were noticed in the group of patients after cold therapy and the group of patients without the use of cold therapy. In the first case it totalled 11% (from 35 to 31). In the case of patients without cryotherapy applied, the decrease was by 24% (from 37 to 28). Before the treatment, problems with climbing stairs were indicated by 19 patients in the group I and by 20 patients in the group II. After the rehabilitation, the results decreased by 32% (from 19 to 13) and by 10% (from 20 to 18). No changes were noticed in terms of problems with maintaining personal hygiene. There was a slight difference in terms of problems while shopping. It concerned group I only (without cryotherapy) and totalled 20%, which is 1 as a nominal value (from 5 to 4). In terms of problems with getting up, patients from both of the groups after the rehabilitation chose 2 answers less than previously (Figure 2 and 4).

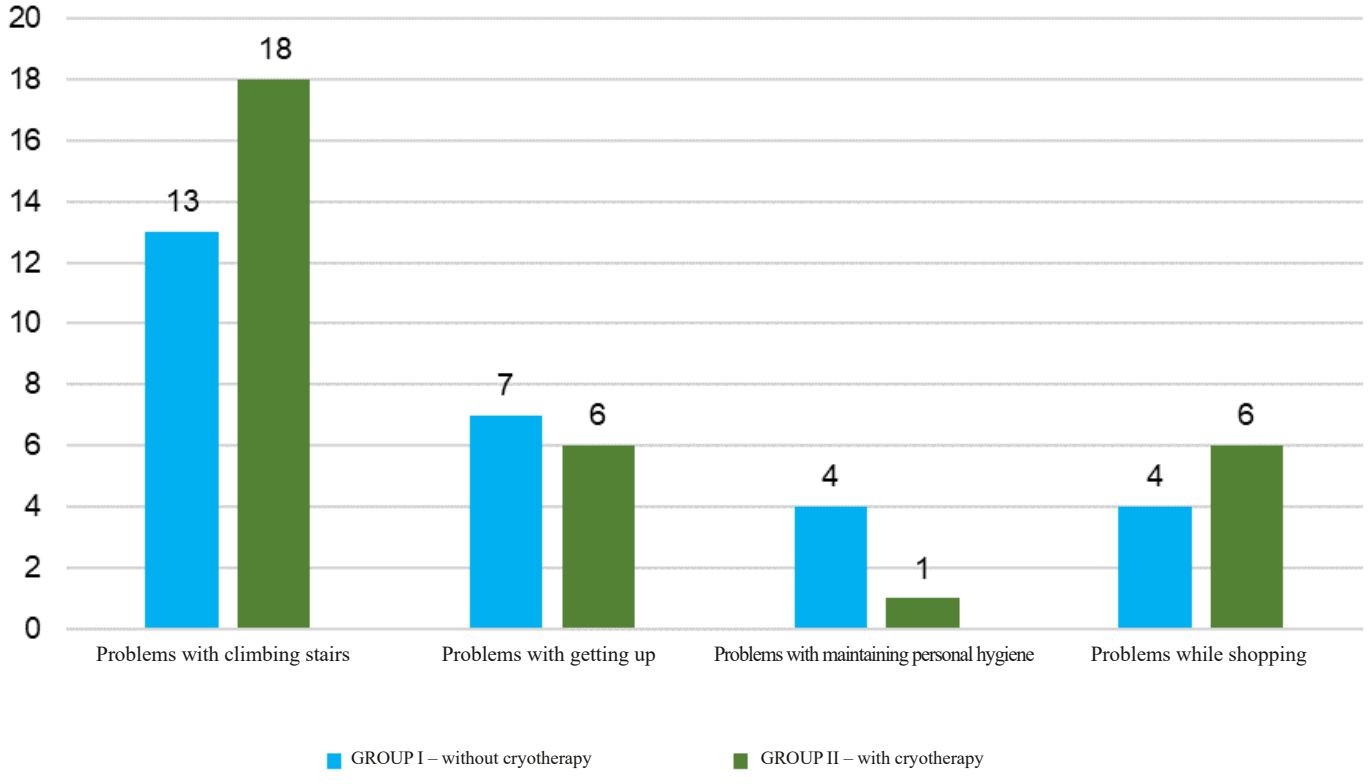


Figure 4. A quantitative distribution of patients from the research group on the basis of difficulties in daily life after the rehabilitation

Among 40 participants, 78% after the rehabilitation noticed health improvement in terms of gonarthrosis. In terms of the division into groups of patients with and without cryotherapy, it totalled 75% and 80% respectively. No health improvement was indicated by 20% of patients in the group I and by 25% of patients in the group II. It means that from the patients' point of view, regardless of whether cold therapy was applied or not, their health condition was similarly improved.

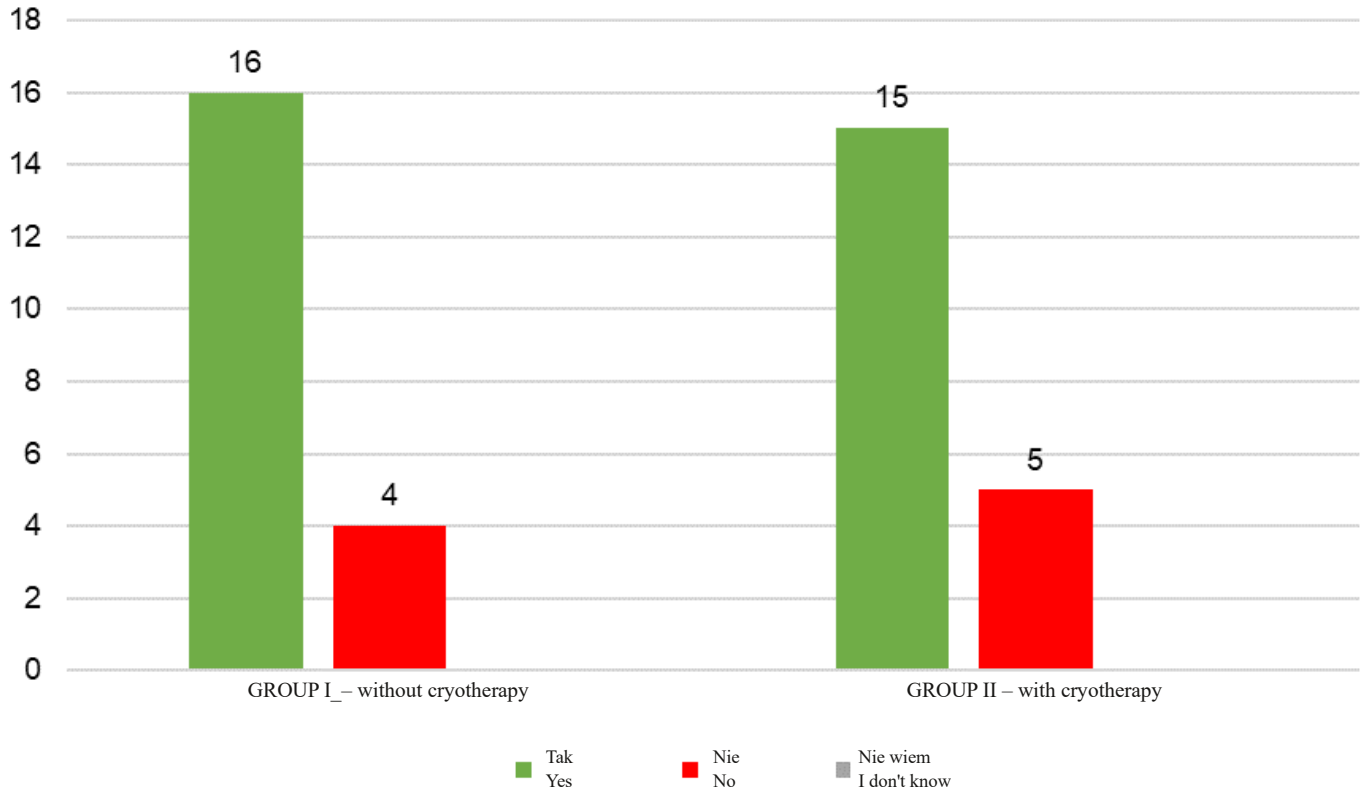


Figure 5. A quantitative distribution of patients from the research group on the basis of the general assessment of health improvement in terms of gonarthrosis

Discussion

Cryotherapy is claimed to be an effective method of treatment not only in acute conditions and directly after traumas, but also in chronic conditions and osteoarthritis, and even in rheumatic conditions. [8] Due to cryotherapy being widely applied in preventing healthcare and treatment, it is commonly applied in physiotherapy. At the same time, the induced mechanism of a human body with the use of this method is simple and well-researched. Cryotherapy is applied in both systemic and topical treatments. Due to the prevalence of the use of cold therapy, constant undertaking of studies on its effectiveness in therapy is legitimate. To that end, the choice of various research groups is undoubtedly crucial as they differ in terms of parameters such as age, weight, type of work performed, or a disease entity in which cryotherapy might be applied. The results represent a further attempt to gain more knowledge about the use of cold therapy in physiotherapy. A survey questionnaire that was applied in this study allowed for gaining knowledge about the patients' evaluation regarding the decrease in complaints and difficulties in daily life after the rehabilitation with and without the use of cryotherapy. The research group also expressed their opinion on their general health improvement. Quantitative results allowed for drawing conclusions that cryotherapy in gonarthrosis in patients' opinion did not improve their health condition more than in patients, who did not undergo this treatment. The conclusions drawn on the basis of this study cannot serve as a basis for undermining other numerous queries. However, they constitute an interesting point of references for

further studies on the analysis of the effectiveness of cryotherapy in gonarthrosis.

Conclusions

The following conclusions were drawn on the basis of carried out survey research:

1. Physiotherapy treatments with the use of cryotherapy in patients with gonarthrosis provided similar general health improvement as treatments without the use of cryotherapy.
2. Regardless of the rehabilitation being applied with or without cryotherapy, from the patients' point of view, there was a decrease in complaints and difficulties in daily life that resulted from gonarthrosis.
3. Physiotherapy treatments with the use of cryotherapy allowed patients for less decrease in complaints and difficulties in daily life than physiotherapy treatments without the use of cryotherapy.

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