

## Research Article

# The Effect of Local Cold Compression upon Pain and Movement Restriction among Patients with Knee Osteoarthritis

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## Abstract

**Aim:** The current study focused on examining the effect of local cold compression upon pain and movement restriction among patients with knee osteoarthritis.

**Background:** Knee Osteoarthritis (OA) is one of the most common non-inflammatory rheumatic joint diseases which occurs on synovial bone as a result of imbalance between joint cartilage synthesis and its destruction. And it characterized with damaged joint cartilage, new bone formation on joint cartilage, joint pain and movement restriction. The aim of knee OA treatment is to control pain, movement restriction and other symptoms, to slow disease progression, to increase and to maintain patients' movement function. Local cold compression, one of the non-pharmacologic methods, produces such effects as eliminating/reducing pain, preventing edema and slowing inflammation process by providing local therapeutic anesthesia. Therefore, importance of cold compression is emphasized among patients with arthritis.

**Design:** This was a semi-experimental study designed with one group in pre-test and post-test model.

**Method:** The study population was composed of ambulatory patients who presented to Orthopedics and Traumatology, Physical Treatment and Rehabilitation Policlinics of Erzurum Palandoken Public Hospital. The study sample was consisted of 70 knee OA patients who were diagnosed with knee OA by physicians, whose diagnosis was clinically confirmed in collaboration with physicians according to criteria of American College of Rheumatology, volunteered to participate in research study, had no cold allergy or sensitivity, were able to communicate and did not have any psychological disorder. The study was done by observing these 70 patients who were assigned to experimental group (n=35) and control group (n=35). The data were collected after oral consent and written informed consent was obtained from the patients. The data were collected using Socio-Demographic Information Form, Health Assessment Survey, Numerical-Rating Scale and Cold Compression Chart. For the analyses of the data, t-test and two-factor ANOVA with repeated measures were used and analyses were processed with SPSS for Windows 15.00 Release statistical package software.

**Results:** In the study in which knee OA patients received cold compression, it was identified that difference between the patients with OA knee in the experimental and control groups was statistically significant in terms of average post-test scores regarding pain complaint ( $t=-2.397$ ,  $p=.020$ ). It was found that as compared to the control group, local cold compression applied to the experimental group provided bigger decrease in pain complaints in the post-test than pre-test. In the study in which knee OA patients were treated with cold compression, it was identified that difference between the experimental and control groups was statistically insignificant in terms of average post-test scores regarding movement restriction complaint ( $t=-.924$ ,  $p=.359$ ). According to the repeated measures, it was noted that being in a different group did not produce any statistically significant difference in movement restriction complaints ( $F_{(1,59)}=8.149$ ,  $p=.006$ ); which made us suggest that the experimental group patients and the control group patients showed different results in terms of decrease in movement restriction complaints.

**Conclusion:** We are of the opinion that cold compression will be beneficial for preventing pain and movement restriction among patients with knee OA.

**Relevance to Clinical Practice:** It may be recommended that OA patients should be informed about cold compression and its benefits and patients should be encouraged to apply cold compression by themselves at home.

**Keywords:** Nursing; Cold application; Knee osteoarthritis; Pain; Movement restriction

## Introduction

Treatment and care of musculoskeletal system diseases, which increases with aging, play a crucial role in maintaining health and improving quality of life. One of these diseases is osteoarthritis prevalence of which is very high-particularly- among those over 50 years [1]. OA is the most common form of arthritis and is defined as degenerative joint disease caused by inflammation, stiffness, and eventually by cartilage loss [2]. Knee OA is a widely prevalent joint disease over the world. In the USA, OA affects nearly 40 million women and men. It is estimated that this ratio, which almost makes up 15% of the general population, will rise to 18.2% by 2020; in other words, 59.4 million Americans will be affected [3]. It is also estimated that by 2030 there will be 67 million people diagnosed with OA in the United States [4]. "Turkey Osteoarthritis Study (2005)", is considered as the most extensive study in Turkey on this issue, it is stated that one man versus three women is OA patient. However, the study done with 3755 OA patients in nine provinces does not shed light on the ratio of the population affected by OA [5]. The knee osteoarthritis rate in Turkey is reported to be 14.8% [6]. The most crucial clinical signs of knee OA are pain, movement restriction and joint stiffness. The aim of knee OA treatment is to control pain, movement restriction and other symptoms; to slow disease progression; to increase and to maintain patients' movement function [7,5,8]. It is widely accepted that no methods can prevent the disease completely [9,10]. Therefore, patients should protect themselves from side effects of the treatments. In many cases, pharmacological and non-pharmacological methods can be employed together as these are the best ones in pain control [11,9,10]. Local hot or cold compression, which is a non-pharmacological method, has been used for a long time for reducing pain, stiffness and swelling among OA patients [12,13]. Generally; physiological effects of hot are vasodilatation, increase in capillary permeability, acceleration of cell metabolism, muscle relaxation, acceleration of inflammation, reducing pain by relaxing muscles, sedative effects and reducing joint stiffness by decreasing synovial fluid [14]. In a study done by Mazzuca et al. [15], heat-retaining knee sleeve was compared to cotton elastic knee sleeve and the difference between was found statistically insignificant. In this study, patients continued pharmacological treatment. Physiological effects of cold are vasoconstriction, slowing down in cell metabolism, local anesthesia, reduce in blood flow, oxygen, metabolite flux to the site and waste products. Therefore, local cold compression exerts such effects as reducing/terminating pain, preventing edema and slowing down inflammation process by providing local anesthesia therapeutically. Therefore, importance of cold compression among arthritis patients has been emphasized [16,14,17].

## Research Hypotheses

H.1. Cold compression applied to patients with knee osteoarthritis reduces pain.

H.2. Cold compression applied to patients with knee osteoarthritis reduces movement restriction.

## Background

Osteoarthritis is a chronic disease that is characterized with joint cartilage erosion, bone hypertrophy to bone edges, biochemical and morphological changes in sub-chondral sclerosis, synovial membrane and joint capsule and leads to movement restriction, disability and severe pain. Knee OA is characterized with deterioration in joint cartilage covering over the edges of joint bones [4,18,19]. Knee OA affects 20.7 million Americans aged 45 and over. It is estimated that 46 million annual doctor visits occur and 3.7 million patients are hospitalized in the USA due to knee OA. In our country, although the studies relating to prevalence of musculoskeletal system diseases are insufficient, in a study undertaken by Seçkin et al. [20], it was identified that 33% of 1560 geriatric patients who were aged 65 and over and who visited a physical treatment and rehabilitation policlinics in 1998 were diagnosed with knee OA.

Etiology of OA is not known exactly. It is stated that mechanic, bio-mechanic and genetic factors play a role [10,21]. The most important factors that are effective in the formation of knee OA are obesity, sex, age, traumas in knee joints, working in jobs that require excessive mechanic force against knees such as climbing up stairs, knee bending, sportive competitions that force or damage joints, wearing high heel shoes, lack of movement and genetic predisposition [12,22]. The most evident symptoms of knee OA are pain, movement restriction and strong stiffness in joints in the mornings. Knee OA diagnosis is made through patient history, radiography and physical examination. There are not any standard diagnosis tests for knee OA. However, laboratory tests are principally used to make a definitive diagnosis and to rule out other rheumatic diseases [23]. For knee OA diagnosis, certain criteria have been designated by the American College of Rheumatology (ACR) [2]. There is no treatment that will stop degenerative process in knee OA, but with a suitable treatment, patients are relieved effectively. As pointed out by Kartal, the aim in knee OA treatment is to control pain, movement restriction and other symptoms, to provide optimal joint function, to reduce movement restriction and to raise awareness among patients and their families about the disease and its treatment [24,19]. Cold compression is locally or systemically applied for therapeutic purposes and provides a drop in tissue temperature. Cold treatment has empirically been used since ancient ages for curing some diseases. The study of Metin [16] reported that first ice compression for joint problems was done by Swdomae in 1823 to cure gouty joints and Swdomae wrote a book on therapeutic use of ice in 1824 [5,8]. In the treatment of knee OA, the aim is to improve the quality of life by controlling pain, stiffness and other symptoms, slowing the progression of the disease, increasing and maintaining the physical function of the patient. In this respect, it is thought that this application may help treatment because of the low side effects, easy application and non-invasive application [14].

**Table 1:** Demographic characteristics of the sample.

| Characteristics                              |                               | N         | %          |
|--|-------------------------------|-----------|------------|
| Age  | 30-49 years                   | 12        | 20         |
|  | 50-64 years                   | 25        | 41         |
|  | ≥65 years                     | 24        | 39         |
| Sex  | Female                        | 50        | 82         |
|  | Male                          | 11        | 18         |
| Marital status                               | Married                       | 61        | 100        |
| Educational status                           | Illiterate                    | 25        | 41         |
|  | Literate                      | 14        | 23         |
|  | Primary school                | 18        | 30         |
|  | Secondary school-high school  | 3         | 4.9        |
|  | Higher school                 | 1         | 1.6        |
| Employment status                            | Employed                      | 3         | 4.9        |
|  | Unemployed                    | 58        | 95         |
| BMI  | Normal                        | 6         | 9.8        |
|  | Overweight                    | 24        | 39         |
|  | Obese                         | 31        | 51         |
| Systemic disease                             | Yes                           | 36        | 59         |
|  | No                            | 25        | 41         |
| Complaint that made patient go to hospital   | Knee pain                     | 37        | 61         |
|  | Pain and movement restriction | 24        | 39         |
| Application to hospital due to the complaint | First time                    | 18        | 30         |
|  | Many times                    | 43        | 71         |
| Affected knee                                | One knee                      | 42        | 69         |
|  | Both knees                    | 19        | 31         |
| Duration of complaint                        | Less than a year              | 12        | 20         |
|  | 1-4 years                     | 32        | 53         |
|  | 5-9 years                     | 10        | 16         |
|  | ≥10 years                     | 7         | 12         |
| History of damage or injury to joints        | Yes                           | 22        | 36         |
|  | No                            | 39        | 64         |
| OA in the family members                     | Yes                           | 29        | 48         |
|  | No                            | 32        | 53         |
|  | <b>TOTAL</b>                  | <b>61</b> | <b>100</b> |

Although the aim in knee OA treatment is to eliminate symptoms of the disease, the first step is to train patients [5,8]. Nurse, playing a significant role in rehabilitation team, is the one who informs patients and their families about disease progress and the outcomes through highlighting his/her training role and spending more time with patients. A training that will teach patients about self-practiced methods like coping methods will enhance patients' adaptation into treatment and prevent possible complications in the future. Moreover, nurse can very well observe and assess outcomes of the treatment arranged by the physician [25,26]. Owing to his/her responsibility to provide a care of higher quality, nurse must base nursing decisions on evidences. It is crucial that nursing compressions should be evident-based in order to improve quality of care and care results, to create a

difference in clinical compressions and patient care, to standardize care and to increase nurse satisfaction [27,28].

## Methods

This was a semi-experimental study designed to assess the effect of local cold compression upon pain and movement restriction among knee OA patients. The study population was composed of ambulatory patients who presented to Orthopedics and Traumatology, Physical Treatment and Rehabilitation Policlinics of Erzurum Palandoken Public Hospital and were diagnosed with knee OA. The study sample was consisted of 70 knee OA patients who were diagnosed with knee OA by physicians, whose diagnosis was clinically confirmed in collaboration with physicians according to criteria of American College of Rheumatology. These patients, who had no cold allergy or sensitivity, volunteered to participate in study. They were able to communicate and did not have any psychological disorder. The study was done by observing these 70 patients who were assigned to the experimental group (n=35) and control group (n=35). Those patients who joined the study and were diagnosed with knee OA in line with ACR criteria were randomly recruited to -first- the experimental group and -then- to the control group according to medical examination queue. 4 patients in the experimental group and 5 patients in the control group did not want to participate in and dropped out the study because some did not want cold compression and some were not contacted. Thus, the study was done with 61 patients.

Following tools were used in the study in order to collect data:

- Socio-demographic Information Form
- Health Assessment Survey (HAS)
- Numerical-Rating Scale-NSR
- Cold Compression Chart

## Ethical considerations

Ataturk University Health Sciences Ethical Board ethically found the study suitable (Ethics Approval Number: 018448-018449). The necessary written official permission from the hospital management of Palandoken State Hospital was obtained for implementation phase of the research (Approval Number: 25475-321). Before initiating compression, all patients were informed regarding the purpose of the study and study plan and their oral consents/written were also obtained.

## Procedure

The data of the study were collected by the researcher using Numerical-Rating Scale, Health Assessment Survey, Socio-demographic Information Form the 70 knee OA patients were randomly recruited as the experimental and the control groups according to policlinic visits. During the compression step of the study, patients were informed by the researcher about the compression and oral consents of those patients who joined the study were obtained. Data collection form (Socio-demographic Information Form), Health Assessment Survey (HAS) and Numerical-Rating Scale-NSR were filled in by the researcher through face to face interview method. Statements in these forms were read to patients and response of the participants was recorded. In addition to routine treatment plan recommended by the physician, the patients in the experimental group

**Table 2:** Distribution of pain scores before and after treatment.

| Source of the variance         | Total chi-square | S.d.     | Average square | F            | P           |
|--------------------------------|------------------|----------|----------------|--------------|-------------|
| Inter-subjects                 | 2767.869         | 60       |                |              |             |
| Group (Experimental / Control) | 142.716          | 1        | 142.716        | 3.208        | 0.078       |
| Error                          | 2625.153         | 59       | 44.494         |              |             |
| Intra-subjects                 | 3044.428         | 61       |                |              |             |
| Tests (pre-post)               | 1882.329         | 1        | 1882.33        | 103.65       | 0           |
| <b>Group * test</b>            | <b>90.591</b>    | <b>1</b> | <b>90.591</b>  | <b>4.988</b> | <b>0.03</b> |
| Error                          | 1071.508         | 59       | 18.161         |              |             |
| Total                          | 5812.297         | 121      |                |              |             |

**Table 3:** Distribution of movement restriction scores before and after treatment.

| Source of the variance         | Total chi-square | S.d.     | Average square | F            | P           |
|--------------------------------|------------------|----------|----------------|--------------|-------------|
| Inter-subjects                 | 878.295          | 60       |                |              |             |
| Group (Experimental / Control) | 0.198            | 1        | 0.198          | 0.013        | 0.908       |
| Error                          | 878.097          | 59       | 14.883         |              |             |
| Intra-subjects                 | 286.869          | 61       |                |              |             |
| Tests (pre-post)               | 110.574          | 1        | 110.574        | 42.12        | 0           |
| <b>Group * test</b>            | <b>21.394</b>    | <b>1</b> | <b>21.394</b>  | <b>8.149</b> | <b>0.01</b> |
| Error                          | 154.901          | 59       | 2.625          |              |             |
| Total                          | 1165.164         | 121      |                |              |             |

received cold compression for 15 times in total for 4 weeks and every other day. The first compression was performed to the patient by the researcher at the first interview and the patient had a training related to how compression should be applied. As for the control group, they did not receive any other compression or treatment except the one recommended by the physician. As the pharmacological treatment, paracetamol-type medications and topical creams were given to the ambulatory patients who were examined at the polyclinics and were diagnosed with knee OA by the physicians. The patients who made up the experimental group were contacted on phone every other day and were told to apply cold compression on OA knees and were asked to fill in the cold compression charts. These charts were also filled in by the researcher, too. As a result of four week compression, the patients in the experimental group were recalled back to hospital together with the cold compression charts they filled in. For the patients in the control group, an appointment was made to interview again four weeks later.

### Data analysis

For the analyses of the data, two different statistical analyses were employed and these analyses were processed via SPSS for Windows 15.00 Release package program. These analyses were t-test and two-factor ANOVA with repeated measures, a multi-factor model often used for the data clustered by two factor mixed models.

### Findings

Table 1 included participants' demographic characteristics. When the demographic characteristics were investigated, it was found that 82% of the participant patients were female, 18% of them were male, 19.7% of them were aged between 30 and 49 years, 41% of them

between 50 and 64 years and 39.3% of them  $\geq 65$  years, 41% of them were illiterate in terms of educational status. 95.1% of them were not employed/working, all of the participants were married and 59% of them had a systemic disease. As for the Body Mass Index, 50.8% of the patients were obese, 39.3% of them were of overweight and 9.8% of them were of normal weight. It was identified that 60.7% of the participant patients were referred to hospital because of knee pain while 39.3% of them due to both knee pain and movement restriction. 70.5% of the patients previously went to hospitals due to pain and movement restriction complaints. The ratio of the patients whose one knee was affected by OA was 68.9%. According to duration of disease, it was seen that 52.5% of the patients suffered from knee OA for 1-4 years. 63.9% of the patients reported no history of damage or injury to knee joint(s). It was identified that 52.5% of the patients did not have any OA patients in the families while family members of 47.5% of the patients had OA -such as fathers, mothers and siblings.

When (Table 2) that demonstrated results on pain was investigated, it was identified that difference between pre-treatment and post-treatment was statistically significant in terms of pain complaints made by patients with OA knee in the experimental and control groups ( $F_{(1,59)}=103.646$   $p=.000$ ). This finding pointed out that pain complaints of both patients in the experimental group and those in the control group decreased in post-treatment as compared to pre-treatment. According to the repeated measures, it was noted that being in a different group did not produce any statistically significant difference in pain complaints ( $F_{(1,59)}=4.988$   $p=.029$ ).

When (Table 3) that showed results on movement restriction was investigated, it was found the difference between pre-treatment and post-treatment was statistically significant in terms of movement restriction complaints made by patients with OA knee in the experimental and control groups ( $F_{(1,59)}=423.116$   $p=.000$ ). This finding suggested that pain complaints of both groups decreased in post-treatment as compared to pre-treatment. According to the repeated measures, it was noted that being in a different group did not produce any statistically significant difference in pain complaints ( $F_{(1,59)}=8.149$   $p=.006$ ).

## Discussion

### Discussion over findings related to patients' demographic characteristics

In the sample of the study, there were 61 patients, 82% of which were female patients. In the study of Gurer et al. [29] done with OA patients ( $n=81$ ), it was found that most of the patients were women. In the study of Atamaz et al. [30] undertaken with knee OA patients ( $n=141$ ), too, most of the participants were (F/M= %76.6, %23.4) female. In the descriptive studies, it was determined that the disease that progressed with knee OA was more prevalent among women. In the current study, it was found that number of the female patients (82%) was higher according to distribution of sex variable among knee OA individuals.

In the study, it was identified that 41% of the knee OA patients belonged to 50-64 age group. The study of Oneş et al. [31] done with knee OA patients ( $n=80$ ) revealed that most of the patients were in this age group. The study of Parlar 13 [31] indicated that 50% of OA patients belonged to 48-57 age group. It was seen that age groups in

the other studies that were done with OA patients were similar to ours.

When the distribution of the patients in the experimental and control groups was examined in relation to marital status, it was found that all the patients were married. In the study of Atamaz et al. [30] done with knee OA patients, it was found that more than half of the patients were married (69.5%). In the study of Ulusoy and Yıldırım [32], majority of the patients were married. Similarly, in the study of Groessl et al. [33] done with elderly OA patients, it was identified that most of the patients were married, too. That all the patients were married in the current study is important in the sense that there were people who could support the patients in coping with disease symptoms or who could help them meet their daily needs.

When the distribution of the patients in the experimental and control groups was examined in relation to educational status, it was identified that 41% of the patients were not literate. In the study of Parlar [13], it was found that 33.3% of the patients were illiterate. The study of Soeroso et al. [34] reported that knee OA development risk was lower among those with high educational status; which may be correlated with the fact that people with high educational status care more about themselves and their health than those with low educational status.

It was seen that 95.1% of patients with knee OA did not work anywhere. The study of Soeroso et al. [34] revealed that nearly all of the female patients with symptomatic knee OA were housewives and did not work at all. The study of Ulusoy and Yıldırım [32], too, reported that majority of the patients were housewives and did not work. In our opinion, being female, low their educational level and advanced age ( $\geq 50$  years) may have contributed to patients' not working.

When the variable whether or not patients had another disease was examined, it was identified that 59% of knee OA patients suffered from another disease apart from OA. The study of Atamaz et al. [30] done with OA patients explored that patients had gastrointestinal disorders (46.1%), hypertension (41.1%), diabetes mellitus (369%), and anemia (34.8%). In the study of Kee [35]; of the 20 OA patients, 14 patients had hypertension, 3 patients diabetes, 2 patients thyroid problems, 4 patients musculoskeletal problems.

The participant patients were examined in BMI distribution and it was seen that 50.8% of the patients were obese, 39.3% of them were of overweight and 9.8% of them were of normal weight. Obesity is a critical risk factor for knee OA. The correlation between knee OA and obesity is more evident –particularly- among women. It was found that high BMI influenced muscle strength of lower extremities negatively. In a study done with arthritis patients aged  $\geq 55$  [36], it was demonstrated that obesity was an important risk factor for inabilities among OA patients. Obesity creates mechanical disadvantage for patients. Excessive weight exerts abnormal influence upon knees among these patients by requiring more muscle strength and at the same time, affects joints' bio-mechanics negatively [37]. Results concerning BMI of the studies conducted with OA patients were similar to results of the current study. The fact that half of the participant patients were obese made us conclude that they could suffer from such serious problems as knee pain and movement restriction.

When patients were examined regarding their reason to apply to hospitals, it was seen that 60.7% of patients complained of knee pain. In the study of Jakobsson and Hallberg done with elderly OA patients in 2002, it was reported that 88.2% of these patients experienced various degrees of pain -from slight pain to severe pain-. In the study of Cerit undertaken in 2003, it was found that 98.1% of the knee OA patients had pain. In the current study, it is evident that distribution of pain complaints of knee OA patients was consistent with the literature (67.7%).

When the distribution of knee affected by OA was examined, only one leg of the 68.9% of the patients was affected by OA (Table 1). The study of Naaman conducted in 1990 revealed that the ratio of the patients whose both knees were affected by OA was 86.6%. The study of Ulusoy and Yıldırım [32] explored that the ratio of the patients whose both knees were affected by OA was 73.9%. In the current study, the fact that distribution of knee OA patients was 68.9% according to the knee affected contradicted with other studies.

When duration of disease was examined, it was identified that 52.5% of the patients suffered from knee pain and movement restriction for 1-4 years whereas 19.7% of them had these complaints for less than a year (Table 1). Acıkgöz et al [6], it was detected that the mean duration of disease-related symptoms of patients with knee OA was found to be  $5.01 \pm 2.86$ .

36.1% of the participant patients reported history of damage or injury to knee joint(s). In the study of Soeroso et al. [34], it was detected that 4.2% of the knee OA patients had damage or injury to knee joint(s). The relevant finding obtained in the current study was higher comparing to the literature.

When distribution of the patients was examined in terms of OA disease in the family members, it was identified that 52.5% of the patients did not have any family members with OA while 47.5% of the patients had family members with OA. The study of Ulusoy and Yıldırım [32] reported that the number of the patients whose family members had knee OA disease was higher. The current study did not concur with the literature in terms of family members having knee OA.

### **Discussion over findings related to local cold compression and pain**

In the study in which knee OA patients received cold compression, it was identified that difference between the patients with OA knee in the experimental and control groups was statistically significant in terms of average post-test scores regarding pain complaint ( $t = -2.397$ ,  $p = .020$ ). Thanks to the local cold compression applied to the patients in the experimental group, it was seen that average pre-test pain complaint score of the experimental group was 19.23 whereas their average post-test pain complaint score was 10.32. As for the patients in the control group, average pre-test pain complaint score was 19.57 whereas their average post-test pain complaint score was 13.50 (Table 2). Accordingly, it may be argued that pain complaints of both groups decreased; which indicated that there was a decrease in pain complaints of both groups and an improvement in the disease complaints. The difference between before and after cold compression application was statistically significant in terms of pain complaints on behalf of knee OA patients for whom cold compression was

applied ( $F_{(1,59)}=103.646$   $p=.000$ ). This finding pointed out that pain complaints of both patients in the experimental group and those in the control group diminished in post-treatment as compared to pre-treatment. According to the repeated measures, it was noted that being in a different group did not produce any statistically significant difference in pain complaints ( $F_{(1,59)}=4.988$   $p=.029$ ); which made us suggest that the experimental group patients and the control group patients showed different results in terms of decrease in pain complaints. It was found that as compared to the control group, local cold compression applied to the experimental group provided bigger decrease in pain complaints in the post-test than pre-test (Table 2).

The thesis study of Kocagil [38] which emphasized that Melzack's ice massage treatment was effective in line with the study of Clarke et al. which pointed out that ice treatment could result in an improvement in pain parameters in three weeks. In a study done by Melzack, ice massage and TENS treatment were compared among patients with back pain and it was reported that ice massage applied to trigger points of muscle pain, skeleton pain, soft tissue pain and joint pain provided a relief and relaxation and it was concluded that ice massage was an effective therapeutic method alternative to TENS [38]. The study findings related to pain were consistent with those of Adegoke and Gbeminiyi [39] that demonstrated that ice treatment provided an effective amelioration in knee OA pain.

### Discussion over findings related to local cold compression and movement restriction

In the study in which knee OA patients were treated with cold compression, it was identified that difference between the experimental and control groups was statistically insignificant in terms of average post-test scores regarding movement restriction complaint ( $t=-.924$ ,  $p=.359$ ). Thanks to the local cold compression applied to the patients in the experimental group, it was seen that average pre-test movement restriction score in the experimental group was 8.32 whereas their average post-test movement restriction complaint score was 5.71. As for the patients in the control group, average pre-test movement restriction score was 8.17 whereas their average post-test movement restriction score was 6.47. Accordingly, it may be argued that movement restriction complaints of both groups decreased; which indicated that there was a decrease in movement restriction complaints of both groups and an improvement in the disease complaints.

It was found that in terms of movement restriction complaints made by patients with OA knee to whom cold compression was applied, there were statistically significant differences between pre-treatment and post-treatment in relation to cold compression ( $F_{(1,59)}=423.116$   $p=.000$ ). This finding suggested that movement restriction complaints of both patients in the experimental group and those in the control group decreased in post-treatment as compared to pre-treatment. According to the repeated measures, it was noted that being in a different group did not produce any statistically significant difference in movement restriction complaints ( $F_{(1,59)}=8.149$   $p=.006$ ); which made us to suggest that the experimental group patients and the control group patients showed different results in terms of decrease in movement restriction complaints (Table 3). The findings of the study of Clarke et al [38], that pointed out that ice treatment could result in an improvement in inactivity parameters

in three weeks were in line with the finding of the current study that local cold compression applied to the experimental group yielded more decrease in movement restriction complaints than the control group as compared to pre-treatment. In regard with the inability to perform some vital activities due to movement restriction; that complaints decreased in both groups and -what's more- patients of the experimental group demonstrated higher decrease in complaints in post-treatment than pre-treatment was in consistent with the study of Kocagil [38] that ice massage group showed better walking parameters thanks to the ice treatment. Besides, the study of Koyuncu et al [38-44], undertaken to assess cold compression among OA cases concurred with the current study in terms of improvement in activity parameters.

### Conclusion and implications for nursing

In the current study done to assess effect of local cold compression upon pain and movement restriction among knee OA patients, pain complaint scores of the knee OA patients in the experimental and the control groups were compared and it was found that the difference was statistically significant in the experimental group ( $F_{(1,59)}=103.646$   $p=.000$ ). Thus, it was identified that local cold compression applied to knee OA patients exerted a therapeutic/relaxing effect upon pain. When movement restriction complaint scores of the knee OA patients in the experimental and control groups were compared, the difference was found to be statistically significant on behalf of the experimental group ( $F_{(1,59)}=423.116$   $p=.000$ ). Thus, it was concluded that local cold compression applied to knee OA patients exerted a therapeutic/relaxing effect upon movement restriction.

### The following recommendations are made according to the results of the study:

- Knee OA patients should be advised to apply cold compression on their own at home in order to reduce pain and movement restriction,
- Home visits should be realized and telephone counseling should be used in order to facilitate treatment of knee OA patients and to help the patients cope with the disease,
- Advancements in OA care and treatment should be shared with patients in order to affect their views about the disease and future health expectations positively,
- Similar studies in which duration of cold compression will be longer should be done with larger and different samples because the study results represented the study sample only.

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