# Effect of Educational Module about Heat Therapy on Pain and Morning Stiffness among Patients with Knee Osteoarthritis

1. *Shereen Reda Hassan / (BSc, Zagazig University, 2010*

2. *Dr. Wafaa Ismail Shereif/ Professor of Medical-Surgical Nursing Faculty of Nursing / Mansoura University*

3. *Dr. Shereen Abd El-Moneam Ahmed/ Assist. Prof of Medical-Surgical Nursing/ Faculty of Nursing / Suez Canal University*

4. *Dr. Nagwa Mohamed Helmy/ Lecturer of Medical-Surgical Nursing/ Faculty of Nursing / Suez Canal University*

## Abstract

**Background:** Knee osteoarthritis (OA) is a widespread multifactorial joint condition that causes persistent pain and functional problems. It is distinguished by the degeneration of cartilage in joints, resulting in stiffness, discomfort, and diminished movement. The study **aim**ed to evaluate the effect of educational module about heat therapy on pain and morning stiffness among patients with knee osteoarthritis. To carry out the current inquiry, a quasi-experimental approach was used. **Setting**: The research was carried out at the Orthopedic Outpatient Clinics at Suez Canal University Hospitals. **Subjects**: A total of (80) adult patients, with 40 assigned to the (control group) and 40 assigned to the heat treatment (case group) were involved in the research study. **Tools of data collection:** Two tools were used; Tool I, A structured interview questionnaire that used to measure demographic data and patient awareness of the disease; Tool II, self-administered Knee Injury and Osteoarthritis Outcome Score (KOOS), which was used to assess patient-relevant outcomes following knee injury. **Results**: The study found that joint pain and stiffness were the most common symptoms in the heat and control groups, respectively with (80% and 97.5%) and (32.5% and 57.5%). Heat therapy had a strong favorable effect on pain relief, stiffness relief, and physical function improvement by (10.76) pre and post application with statistically significant difference between two groups. **Conclusion**: Heat therapy had a positive effect on pain relief and morning stiffness in people with knee osteoarthritis with statistically significant difference. **Recommendations**: Assess the effect of physical exercises on patients suffering from knee osteoarthritis.

*Keywords:* Educational Module, Heat therapy, Knee Osteoarthritis, Morning Stiffness, Pain

## 1. Introduction

Knee osteoarthritis is a common, progressive joint degenerative disease caused by wear and tear and progressive articular cartilage loss (Elsiwy et al., 2019; Springer, 2019). Osteoarthritis prevalence rises with age, affects women more than men, and is strongly linked to ageing and intensive physical occupational activity. Many risk factors, such as trauma, misuse, and hereditary diseases, contribute to the disease's incidence (Abd Allah et al., 2017).

Patients' complaints of discomfort, physical limits, and functionality restriction rise as the disease progresses, resulting in a significant decline in patients' quality of life (Songül et al., 2019).

Prolonged morning stiffness for more than 60 minutes is considered a symptom of inflammatory arthritis, but has a poor discriminative ability. Patients with these symptoms report more pain in general and have a lower quality of life than patients that do not report these symptoms. Prolonged morning stiffness does not preclude a diagnosis of knee OA (van de Stadt et al., 2023).

A combination of surgical, pharmacological, and non-pharmacological therapy is utilized to treat knee osteoarthritis symptoms (Shafii et al., 2018). Traditional KOA medicines, like as opioids and no steroidal anti-inflammatory drugs, had potentially fatal adverse effects. There are also dangers connected with knee surgery that are not related with various non-pharmacological treatments (Saffari et al., 2018). Numerous non-pharmacological treatments for KOA are available, including patient education, joint protection, weight loss, exercise performance,

and heat compresses (alternating heat therapy) (Basunyet al., 2020).

Heat therapy is a non-pharmacologic therapy that involves a single extended hot application in a treatment session and offers another option for treating a variety of musculoskeletal conditions, including knee OA. It is indicated as a simple and reliable approach to relieve pain in numerous treatment recommendations for osteoarthritis (McAlindon & Bannuru, 2018).

Heat therapy is a popular hydrotherapy treatment in which the hot application opens blood vessels, filling them with blood and causing relaxation in subcutaneous and intramuscular tissues (Ariana et al., 2022) . Therefore, the current study aimed to evaluate the effect of heat therapy on relieving pain and morning stiffness among patients with knee osteoarthritis.

**Significance of the study:**

According to the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIH), OA is Egypt's most common disease, affecting 5,596,869 of the total population. The prevalence of OA is projected to climb as people live longer and become more obese. Based on Johnston County OA

Project data, the lifetime risk of developing symptomatic knee OA is estimated to be 45% (40% in men and 47% in women), with risks increasing to 60.5% among the obese, which is approximately double the risk of those who are normal or underweight (Bennell et al., 2018).

Heat compresses may help people with knee osteoarthritis reduce their pain and stiffness in the morning. As a result, the current study was carried out to give proof for this. It will also relieve patients' complaints and reduce the overall number of hospitalizations for these patients, as well as lower the cost of therapy for OA patients and the hospital's treatment load. The current study's findings will provide evidence for nurses to use heat therapy as therapy regimens to alleviate the misery of OA patients.

**The aim of the study:**

The current study aimed to evaluate the effect of educational module about heat therapy on pain and morning stiffness among patients with knee osteoarthritis.

**This aim was achieved through the following objectives:**

1. Assess levels of pain and morning stiffness in osteoarthritis patients.

2. Design and implement an educational module for heat therapy implementation on osteoarthritis patients

3. Evaluate effect of heat therapy on relieving pain and morning stiffness in OA patients.

**Hypothesis:**

**H$_1$:** Patients who will follow heat therapy educational module benefit from reduced pain caused by knee osteoarthritis.

**H$_2$:** Patients who will follow heat therapy educational module benefit from reduced morning stiffness caused by knee osteoarthritis.

## 2. Subjects and Methods

**Study design:** The current research employed a quasi-experimental study design.

**Study setting:** This research was carried out at Suez Canal University Hospital's Orthopaedic Outpatient Clinics.

**Sample:**

Based on retrospective statistical data, a purposeful sample was selected as they were selected based on inclusion and exclusion criteria. By the year 2020, the number of patients with osteoarthritis at Suez Canal

University Hospital's outpatient orthopedic clinic roughly (1300). The current research included 80-person selected by simple randomization, as patients met in even days were assigned to control group, and patients met in odd days were assigned to heat therapy group with a 95% confidence level based on **Steven Thompson equation, (2012).**

$$n = \left[ \frac{N \times p(1-p)}{\left[ \left[ N - 1 \times \left( d^2 \div z^2 \right) \right] + p(1-p) \right]} \right]$$

**Where:** N=Total population, n= sample size, Z=1.96, D=error level 5%, P=0.5.

**Inclusion Criteria** include that patients aged 20-60 years old are eligible، patients with no concomitant conditions to avoid the effect of cofactors on study results, and the included patients should have had no recent or previous joint surgery. **But,** patients with a communication impairment and obese patients (BMI more than 35) are excluded.

**Tools of data collection:**

Two tools were utilized to collect data pertinent to the current study.

**Tool 1: Structured Interview Questionnaire,** prepared by the researcher and reviewed by a panel of five medical surgical nursing specialists, to identify patients' demographic data and assess patients' awareness of the disease and its therapy. It takes approximately 10 minutes to complete and is separated into three sections:

**Part One,** Demographic Information: It asked about the patients' age, gender, marital status, educational level, job, type of work, and residence.

**Part two, Patient Health Status:** Mohamed & Mohamed, (2019) was used as a source. It includes six items to examine patients' prior history and current health state, such as the duration of osteoarthritis, the affected knee, family members with OA, chronic disorders connected with OA, and BMI.

**Part III, Specific clinical symptoms of knee osteoarthritis and its management:** The researcher adopted and developed it from O'Neill et al., (2018). It asked about indications and symptoms, pain characteristics, morning stiffness, and management options, among other things.

**Tool 2: Joint Injury and Osteoarthritis Outcome Score (KOOS) Joint Survey**. It is a self-administered questionnaire derived from Roos and Lohmander (2003), with a coronbach

alpha of 0.89. The Knee Injury and Osteoarthritis Outcome Score (KOOS) is a questionnaire designed to assess short and long-term patient-relevant outcomes following knee injury by assessing five outcomes: pain, symptoms, activities of daily living, sport and recreation of function, and knee-related quality of life. The tool took roughly 10 minutes to complete with a total of 38 items.

The KOOS's four patient-relevant dimensions are rated independently: Pain (nine items); Symptoms (seven items); ADL Function (17 items); Sport and Recreation Function (5 items). A Likert scale was employed, and all items had five alternative answer possibilities ranging from 0 (no problems) to 4 (extreme problems), with each of the four scores calculated as the sum of the items contained. For each subscale, a normalized score (100 indicating no symptoms and 0 indicating severe symptoms) is generated. The normalized score was then modified to satisfy this criterion using the formulas provided for each Subscale as follows:

- Pain total score (p1- P9) x 100 /36=100 - ----- = 36
- Symptoms and stiffness total score (S1-S7) x 100 /28=100 - ---- =28

- Function, ADL total score (p1- P9) x 100/68 =100 - ----- = 68

The total score for each subscale was classified as Mild (100-66), Moderate (66-33), and Extreme (33-0).

**Content Validity and Reliability:**

**Validity**: The study's generated tools were tested for validity. A team of five specialists from the Faculty of Nursing at Suez Canal University and the Faculty of Nursing at Mansoura University, revised the instruments. This approach was carried out to assess the content validity, completeness, practicality, clarity, understanding, and applicability of the instruments utilized. The necessary changes were made, and the tools had been translated into Arabic via back-to-back translation, with the validity verified after Arabic translation.

**Reliability:** Before collecting data, the tools' reliability was statistically verified to guarantee their dependability. The reliability of research tools based on standardized statistical items for tool I was set at 0.917, and the reliability by coronbach alpha of tool II was set at 0.89, indicating that all of the instruments utilized were highly reliable.

**Pilot study:**

The pilot study was carried out on 10% of the total number of patients in the included sample, which consisted of (80) patients chosen at random. The pilot study was conducted to assess the reliability of the data collection instrument. Also used to determine the clarity, objectivity, relevance, and applicability of the generated tools, as well as to estimate the time required to complete the questionnaire. Changes were made based on statistical analysis of the pilot study results. The results of the pilot study were eliminated since certain changes were made to one of the tools. The pilot research was launched in July 2020.

**Preparatory Phase:**

The researcher designed data gathering tools after conducting an exhaustive study of current national and international literatures connected to the research theme, including books, papers, web sites, periodicals, and journals. Furthermore, this advice acquainted the researcher with the genuine and clear dimensions of the problem.

**Fieldwork:** The study was carried out in five stages: sampling, assessment, planning, implementation, and evaluation. Data were collected during a six-month period, from January 2021 to June 2021.

**Sampling Phase:**

Following approval to proceed with the proposed investigation, participants who met the sampling criteria were included in the study once their consent to participate was obtained. The researcher conducted an interview with the patients to explain the study's objectives and get their verbal agreement. Patients who were met in the even days were assigned to the control group, and patients met in odds days were assigned to heat therapy group.

**Assessment Phase.**

The researcher interviewed the study participants and introduced herself. The patients who met the inclusion criteria were interviewed individually for 10 minutes to explain the nature and goal of the experimental interventions that would be used on them. To acquire baseline data, patients were requested to complete all study tools. This stage needed three months from Jan 2021 to end of March 2021. This stage was implemented at the orthopedic outpatient affiliated to Suez Canal University Hospitals using all the study tools. For illiterate patients; the researcher asked them and fill their answers in the study tools.

**Planning Phase.**

Following the initial patient interview, which included obtaining baseline data, the researcher planned how to effectively explain each intervention by preparing a simple booklet in a simple and clear Arabic language, supported by figures for further clarification based on national and international literatures. This phase highlighted an outcome of relieving pain and morning stiffness in patients with knee osteoarthritis. The educational module contains an overview about the osteoarthritis, heat therapy purposes, advantages, and technique of implementation.

**Implementation Phase.**

The researcher met with the patients twice a week (Sunday-Tuesday), which are Outpatient Clinic days, during the morning shift from 9.00 a.m. to 1.00 p.m. The patients were divided into two equal groups of 40 each by the researcher. The first group was referred to as the heat group because the assigned patients were subjected to heat therapy, while the second group was referred to as the control group since the allocated patients got no experimental intervention during the trial other than the researcher observing their health state and complaints . The researcher analyzed the

patients' pain and morning stiffness using the previous techniques until the control group was completed, then began data collecting from the heat group.

**The Intervention module** consisted of five sessions, one theoretical and four practical. Each patient required six weeks to complete the program, with the first week used for assessment utilizing all of the study materials and explanation of the theoretical session, the next four weeks used for completing the practical part of the program, and the sixth week used for evaluation. Patients who were met on Sunday were assigned to the heat group, whereas patients who were met on Tuesday were assigned to the control group. The interventions were carried out over three sessions for each group, as follow:

**Session (1)**: The purpose of this session was to raise patients' understanding of knee osteoarthritis and the successful strategies for managing it. It included a brief discussion of OA etiology, clinical manifestations, consequences, and management methods. It was assessed by asking patients for input and having them complete a questionnaire.

**Session (2):** Its goal was to teach patients how to use heat therapy techniques to perform effective heat compresses. By giving the patients photographs and films on heat therapy, the researcher described several methods of applying heat and clarified the duration and frequency of compresses. The researcher inquired about the patients' reactions to the session. The application region was initially evaluated for application tolerance, skin integrity, hemorrhage, and circulatory abnormality. Warm water and a tiny towel were used to apply hot compresses for 15 to 20 minutes each day, four times per week, as directed by Archanah et al. (2018).

**Session (3):** Session (3): The purpose of this phase was to analyze the effect of heat therapy by asking patients for input on session (3) and OA symptoms. Filling out the KOOS tool and questioning patients about difficulties encountered while using heat compresses and attempting to resolve the issues. The researcher employed KOOS to assess the evolution of the patient's condition.

**Evaluation Phase:**

The researcher evaluated the patients' level of pain and morning stiffness using tool II and compare between effect of heat therapy and none use in control group on level of pain and morning stiffness pre implementing the intervention and after one-month from application, then comparing the level of pain and morning stiffness among the two groups at different phases of the study.

**Ethical considerations:**

The Faculty of Nursing Ethical Committee granted official approval to undertake the planned study (90/9/2020). The researcher informed the patients that their participation in the study was entirely voluntary, and each participant was educated about the study's purpose, protocol, benefits, and nature. Patients were then asked to give their verbal agreement. The patients were informed that the data acquired would be utilized solely for research reasons and would not be used in any additional studies without their agreement. Each patient's confidentiality and anonymity were ensured by coding all data and protecting all taken information.

**Statistical design:**

The questionnaire data was coded, processed, and analyzed with the Statistical Package for the Social Sciences (SPSS version 23). A paired t test was performed to compare the means of two groups before and after intervention. For multiple comparisons, the

Least Significant Difference was used. To quantify the size of the difference between two times, Cohen's d effect size was used. For significant results, the P value was set to 0.05.

Percentage, mean score degree, standard deviation SD, Paired t-test, One way- ANOVA test, Chi-square test and Monte Carlo chi-square test, Least Significant Difference, Proportion likelihood of error (P- value), and confidence interval were among the statistical approaches employed. The significance of the results was set at P0.05, which indicates a statistically significant difference, and P0.01, which indicates a highly statistically significant difference.

## 3. Results

**Table (1)**, the results revealed that 30%, 32.5%, and 30%, respectively, of the heat group and control group were aged between 40 and 45 years old, with a statistically significant difference between age groups with P value = 0.008. Furthermore, 70% and 75% of the heat and control groups, respectively, were female.

In terms of marital status, 92.5% and 80% of the same sequence in the study groups were married, respectively. The control group had 50% illiteracy and the heat group had 45% moderate education, with a statistically

significant difference between groups with P value.008. In terms of job, 62.5% of the heat group was working with 68% of them requiring moderate effort, whereas 55% of the control group was working with 42.5% requiring moderate effort. Rural areas were home to 72% and 70% of the study groups, respectively.

**Table (2)**, discovered that 57.5% and 60% of the heat and control groups, respectively, had osteoarthritis for less than five years, with both knees afflicted in 35% and 50%. 47.5% and 40% of the heat group and 40% of the control group, respectively, had hypertension, with 50% and 35% of the same groups having a family history of osteoarthritis with the mother being the dominant individual, and 35% and 27.5% of the same groups having the disease in the family. In terms of BMI, the heat group's and control group's mean scores were 35.9% and 34.79%, respectively, with no significant difference.

**Table (3)**: Table (3) revealed that joint pain was the dominant symptom in 80% and 97.5% of the heat and control groups, respectively, followed by joint crepitus in 77.5% and 80%, limitation of movement in 65% and 60%, and stiffness in 32.5% and 57.5% of the heat and control groups, respectively. In terms of time of stiffness, 40%

and 55% of the heat group, respectively, and 40% and 42.5% of the control group, had morning stiffness that occasionally impacted them. Furthermore, 55% and 57.5% of the heat and control groups, respectively, utilized tab to relieve stiffness, whereas 42.5% and 77.5% used physiotherapy to relieve stiffness. Furthermore, 45% and 50% of them, respectively, used hot compresses to relieve stiffness.

**Table (4)** Table (4) revealed that 72.5% and 72.5% of the heat and control groups, respectively, reported pain that lasted shorter than 30 minutes, with 17.5% and 52% having piercing pain. In terms of pain onset, 92.5% of the heat group and 95.5% of the control group experienced intermittent onset, which happened with movement in 62.5% of the heat group and 35% of the time in the control group, respectively.

**Table (5)** showed that there was a statistically significant difference in overall mean stiffness scores between the heat group and the control group after the intervention, with a P value of.001 *

**Table (6):** A high statistically significant difference in total mean pain scores was seen between the heat group and the control group following intervention .

**Table (7):** Revealed a statistically significant difference in percentages between the heat group and the control group with regard to total signs and symptoms of OA with P value0.01* with 90% of the heat group having moderate signs and symptoms level prior to intervention to be changed to 55% in extreme level and 45% in moderate level. Furthermore, 90% of the control group exhibited moderate level signs and symptoms, which were reduced to 85% at moderate level post intervention.

## 4. Discussion

Osteoarthritis is the most common arthritic ailment in people globally, and it is the most prevalent cause of joint pain and disability. It affects 240 million human beings globally. According to the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIH), OA is Egypt's most prevalent disease, affecting 5,596,869 of the total population (NIH, 2016). The prevalence of OA is projected to rise due to ageing and rising obesity. According to Johnston County OA Project data, the lifetime risk of developing symptomatic knee OA is estimated to be (40% in men and 47% in women), with risks increasing to 60.5% among the obese, which is approximately double the risk of those who are normal or underweight (Bennell et al., 2018).

In terms of patient age, the current study found that less than half of the heat group and control group were between the ages of 45 and 49, with a statistically significant difference between the examined groups. According to Mohamed and Mohamed (2019), the majority of patients in the analyzed groups were between the ages of 45 and 55.

This study's findings are also consistent with those of (Cui et al., 2020), who discovered that the majority of patients were above the age of forty. Tan et al. (2017), on the other hand, found that half of patients with osteoarthritis were between the ages of 48 and 57. This finding is reinforced by Hamood et al. (2021), who found that the incidence of osteoarthritis rose with age, with the prevalence peaking at 50 years in women and 55 years in males. This study's findings were also consistent with Vina & Kwoh's (2018) who claim that osteoarthritis is one of the most common kinds of arthritis after the age of 80.

In contrast, Murphy et al. (2018) reported that more than half of the population over the age of 65 has been diagnosed with osteoarthritis, and Saffari et al. (2018) predicted that the prevalence of osteoarthritis will skyrocket in the near future owing to population ageing.

Other investigations involving OA patients showed that the age ranges were similar to the current study. This could be because, as people get older, the risk of obesity increases due to escalating sedentary behaviors, changes in lifestyle habits and dietary routines, and working conditions.

In terms of gender, the current findings revealed that almost three-quarters of the heat group and control group were female. This finding is consistent with a study conducted in Egypt by Abd Elstaar et al., (2016), at Menoufia, Egypt, who discovered that nearly three-quarters of the patients were female. Even these findings are consistent with (Shehata & Fareed, 2018), who discovered that three-quarters of the analyzed sample was female. Furthermore, (Shin, 2017) stated that osteoarthritis of the knee is more common in women than in men.

This can be attributed to hormonal changes, particularly after menopause, which can increase the risk of knee osteoarthritis due to estrogen withdrawal, which can exacerbate degenerative changes in multiple joints, muscle strength changes, and less muscle and more fat cluster loading on joints, pelvic structures, and knees (Deshpande et al., 2016).

In terms of marital status, the current study found that the majority of the patients evaluated were married throughout the study. This finding is consistent with the findings of Ulusoy & Yldrm (2018), who discovered that the majority of the patients evaluated were married. Furthermore, the current study agrees with Azma et al. (2018), who discovered that more than half of the patients evaluated were married. It is noteworthy that the majority of patients in the current study were married in order to find people who could assist them in the use of heat compresses to treat disease symptoms and help them meet their daily demands.

In terms of educational level, when the distribution of patients in the current study was examined, it was discovered that the majority of patients in the heat group were secondary educated, while half of the control group was illiterate. This conclusion contrasts with the findings of Abd Elfatah, Weheida, & Mekkawy (2019), who found that more over half of the patients investigated were illiterate. Uluda & Kaşikçi (2019) discovered that half of the patients were educated. Furthermore, current findings are corroborated by Alkan et al. (2017), who said that higher educated patients had superior functional capacity than elementary school educated patients.

Furthermore, these findings corresponded with the findings of Patel and Mackworth-Young (2016), who discovered that more than one-third of patients were uneducated, and Palazzo et al. (2016), who discovered that those with a high educational status had a lower risk of getting knee OA. This can be related to the fact that people with a high educational level care more for themselves and their well-being than those with a low educational level, and a lack of knowledge might contribute to a lack of awareness of disease and management actions.

In terms of patients' occupations, it was discovered that around two-thirds of the patients worked in jobs that required moderate effort. This contradicts the findings of Uluda & Kaşikçi (2019), who discovered that the majority of KOA patients did not work. Shehata & Fareed (2018) also discovered that almost two-thirds of the sample were housewives. This could be related to patients undertaking everyday labor tasks that put stress on joints, which can lead to knee osteoarthritis, and the work can put additional strain on the damaged knees.

Furthermore, Ulusoy & Yldrm (2018) reported that the majority of patients were housewives who did not work. Furthermore,

according to Lievense et al. (2017), every job needs repetitive tasks, and overloading of joints and associated muscles increases the risk of knee osteoarthritis. The study assumes that patients' non-work is due to their gender, low educational level, and senior age.

In terms of residence, the current data suggest that almost two-thirds of the patients evaluated live in rural areas. This data is consistent with Usenbo et al. (2015)'s systematic review and meta-analysis report, which stated that rural South Africa has the greatest prevalence of knee osteoarthritis. Furthermore, the current study supports the findings of Fransen et al. (2015b), who found that rural patients had around double the prevalence of symptomatic knee osteoarthritis as their urban counterparts.

The current findings are consistent with the findings of Haq & Davatchi (2015), who discovered that the prevalence of OA in rural societies was higher after adjusting for age and gender. This could be because people who reside in rural areas may engage in more difficult activities, such as agriculture, which may raise illness risk.

In terms of the duration of the illness or condition, it was discovered that roughly two-thirds of the individuals studied had knee OA for less than 5 years. These findings are consistent with Uluda & Kasikçi, (2019), who stated that more than half of patients suffered from knee pain and restriction of movement for one to four years. Furthermore, Ackgöz et al. (2017) discovered that the average duration of disease-related symptoms in KOA patients was around five years. Similarly, Mohamed and Mohamed, (2019) showed that nearly two-fifths of the patients investigated had OA from three to less than five years.

In terms of Body Mass Index (BMI), the current findings showed that approximately one-third of the investigated patients were obese, which matched with the findings of Abd Elfatah et al. (2019), who found that more than half of the research patients were obese. It is also consistent with the findings of Uluda & Kaşikçi (2019), who discovered that half of the patients were obese and two-fifths of the patients were overweight.

Furthermore, the findings are consistent with those of Abd Elstaar et al. (2016), who found that obesity, female gender, and advanced age are all substantially related with an elevated risk of knee OA. Several studies, however, have found a relationship between obesity and OA prevalence in non-

weight-bearing joints such as the hand (Thijssen et al., 2015). This could be related to increased articular cartilage strain, which accelerates joint deterioration.

Obesity is also indicated as a major risk factor for knee OA discomfort (Misra et al., 2019). Furthermore, Plotnikoff et al. (2015) found a significant rise in the prevalence of knee osteoarthritis in the obese population. It can be due to the increased mechanical stress of the knee and hip caused by obesity and overweight, which can cause cartilage degeneration in weight-bearing joints.

When the variable whether or not patients had systemic disease was examined, it was discovered that more than half of the patients had systemic disease such as hypertension and Diabetes Mellitus, while more than two-fifths did not. This finding is consistent with Uluda & Kaşikçi's, (2019) who discovered that around two-thirds of knee OA patients had another condition in addition to osteoarthritis. According to Singh et al. (2015), people with OA are more likely than the general population to have Diabetes Mellitus, high blood pressure, renal impairment diseases, and high total cholesterol levels.

Martel-Pelletier et al. (2016) discovered that over half of OA patients had gastrointestinal problems, high blood pressure, and around two-fifths had Diabetes Mellitus and anemia. Ischemia below the cartilage in people with knee OA due to hypertension may be a cause; this type of ischemia may hinder articular cartilage metabolism and bone remodeling.

In terms of a family history of osteoarthritis, the current study discovered that roughly half of the patients had a prior family history of osteoarthritis. The findings are consistent with those of Silverwood et al. (2015), who found that environmental factors, genetic factors, and their interactions are linked to OA susceptibility.

Furthermore, Ulusoy & Yldrm (2018) discovered that there was a larger number of individuals whose family relatives had knee OA condition. However, this study contradicts with the findings of Uluda & Kaşikçi (2019), who observed that more than half of KOA patients had no family members with OA, whereas less than half of patients had family members with OA. Furthermore, this finding contradicted the findings of Shehata & Fareed (2018), who discovered that the majority of

OA patients investigated had no familial tendency to osteoarthritis.

Concerning the signs and symptoms that cause patients to seek medical attention, it has been demonstrated that the majority of the study participants were admitted to the hospital owing to knee difficulties such as joint pain, stiffness, limitation, crepitus, and insomnia. According to the Uluda & Kaşikçi (2019), more than two-thirds of patients complained knee joint pain. Jakobsson & Hallberg (2015) discovered that the majority of senior OA patients experienced varying levels of pain ranging from mild to severe.

In terms of patient complaint and duration, approximately three-quarters of the patients tested complained of joint discomfort, limitation, crepitus, sleeplessness, and morning stuffiness on occasion. This finding was verified by Al-Khlaifat et al. (2016), who stated that the majority of study participants had symptoms such as pain, stiffness, weariness, edema, muscle weakness, and crepitus.

Similarly, Ackgöz et al. (2017) discovered that the average duration of disease-related symptoms in knee OA patients was around five years, with symptoms occurring only seldom. Furthermore, the preceding finding was consistent with Hatefi et al. (2019).

In terms of pain quality and kind among the patients tested, the current study discovered that less than half of the heat group patients experienced squeezing pain, whereas half of the control groups experienced piercing pain. This finding was consistent with the findings of Abd Elfatah et al. (2019), who found that more than one-quarter of knee osteoarthritis patients had the worst pain kind and level.

Furthermore, this conclusion is consistent with the findings of Jebakani et al. (2015), who discovered that more than half of OA patients experienced scorching pain. Jakobsson & Hallberg, (2015) noted that pain is the most prominent symptom of osteoarthritis (OA) and confirmed that pain levels vary among OA patients. Furthermore, Inan and Kyak (2014) discovered that more than three-quarters of patients with osteoarthritis experienced various types of pain.

In terms of pain frequency and time, this study revealed that the majority of patients experienced intermittent pain frequency, and

fewer than half felt pain with movement. These findings are comparable with those of Iwamoto et al. (2011), who discovered that two-thirds of OA patients experienced chronic discomfort. Tan et al. (2021) also reported that the majority of the patients studied exhibited knee joint mobility restriction and sleep disturbance. This could be related to pain, which is the most common symptom in OA patients and constantly disrupts sleep and daily life.

The current study's findings revealed that there is overlap in the time of pain occurrence between the heat and control groups. This finding is consistent with Mohamed's, (2018) findings at Ain Sham, Egypt, in which OA patients claimed that their pain interfered with their work performance. This could be related to increasing pain after long periods of employment.

In terms of the patients' tactics for alleviating stiffness, the current study found that the majority of the patients controlled their pain by using analgesics as self-control trials, while only a small percentage used knee compresses. The current study concurred with Ghaleb, (2015), who discovered that pain management approaches were used by a minority of the analyzed group. This data, however, contradicts the findings of Davis and

Atwood, (2015), who discovered that three-quarters of patients used heat treatment for short pain alleviation. Furthermore, the current study contradicted the findings of Mezey et al. (2022), who discovered that almost two-thirds of patients used diverse pain management approaches.

In terms of knee joint stiffness, the study findings revealed that the majority of the individuals investigated reported morning knee stiffness. This finding is consistent with the findings of Hafez et al. (2015), who found that the life quality of knee OA patients is influenced by knee stiffness, pain, and considerably impaired physical function, which causes sleep disruptions, sadness, and anxiety. Furthermore, the findings were consistent with Ibrahim, (2017), who discovered that all of the participants investigated felt pain and morning stiffness. This could be ascribed to connective tissue or cartilage degeneration, which caused the bones to rub painfully against each other, resulting in stiffness and chronic pain after inactivity.

In terms of total Knee Injury and Osteoarthritis Outcome Score pre and post intervention, the current study results revealed that there was a statistically significant reduction with improvement in total KOOS

mean score and KOOS' five patient-relevant dimensions, which referred to knee associated health symptoms such as pain, other related symptoms, difficulty in performing activities of daily living, difficulty in performing sports and recreational activities, and quality of life. In addition, there was a highly statistically significant difference in total KOOS ratings between pre- and post-intervention.

These findings supported the research hypothesis that applying heat to patients with knee osteoarthritis would reduce the associated symptoms. The findings corresponded with those of Basuny et al. (2020), who discovered that heat compresses had a significant effect on lowering the total mean KOOS and KOOS dimensions scores post-intervention compared to pre-intervention.

Similarly, Ariana et al. (2022) found that both local heat therapy and cold rub gel improved pain and joint symptoms in patients with knee OA.

The findings of this study are consistent with those of Raj and Mol (2017), who discovered that heat compresses were the appropriate safe treatment protocol for symptom relief and knee osteoarthritis-related pain.

Furthermore, Archanah et al. (2018) concluded in their study that hot compress was useful in the management of pain for KOA patients. Furthermore, Shehata & Fareed, (2013) observed that while all three modalities (warm and contrast therapy) resulted in pain reduction, contrast therapy was the most effective protocol of treatment for pain relief.

In terms of comparing pain disability index mean scores before and after intervention, the current study results revealed a highly statistically significant difference between the studied patients before and after intervention in terms of total pain disability index and its categories such as recreation, social activities, and quality of life. These findings agreed with Archanah et al. (2018), who reported that contrast hydrotherapy is considerably effective in lowering knee pain without side effects in individuals with osteoarthritis, improving functional capacity, health status, and quality of life. Similarly, Hatefi et al. (2019) found a statistically significant reduction in the mean disability score of KOA patients.

The current study findings revealed that the majority of studied patients had moderate pain pre-intervention, which was dropped to less than one-fifth post-intervention

with a significant reduction, and there was a highly statistically significant difference in pain severity scores post-intervention as compared to pre-intervention.

These findings agreed with those of Mohamed & Mohamed (2019), who discovered that the majority of patients experienced severe knee pain prior to the administration of hot compresses and that a statistically significant difference was found after the application of heat in connection to patients' pain severity. Furthermore, the previous findings were consistent with Raj & Mol, (2017), who discovered a statistically significant difference in total score of the numerical pain scale, post-implementation of heat treatment. According to the researchers' experience, these findings could assure that heat therapy is chosen by patients because it is a straightforward and reliable non-pharmacological treatment for pain alleviation with no adverse effects on patients' health.

Furthermore, the previous findings were consistent with Abd El fatah et al. (2019), who indicated that the heat group had a lower mean pain score than the control group, with highly statistically significant differences. In a similar vein, Basuny et al. (2020) confirmed that there was a highly statistically significant

change in pain intensity scores after the administration of heat compresses compared to before the intervention.

Archanah et al. (2018) concluded in the same context that a hot treatment is useful in the management of pain and improves range of motion (ROM) in the case of KOA. As a result, the study data verified the research hypothesis that heat treatment reduces the severity of pain in patients with knee osteoarthritis. Non-pharmacological therapy techniques such as local heat therapy have been widely used in the management of knee OA. The current study's findings indicated the effectiveness of heat treatment in managing pain and overcoming handicap in everyday physical activities. Because local heat treatment has been demonstrated to be the most effective way for lowering pain and boosting physical activity, it may be the preferred method for managing patients.

## 5. Conclusion:

The current study found that a low-cost, easily-applied heat intervention is an effective conservative treatment for Knee OA in terms of pain and physical function. The current study found substantial differences in pain, physical function, and

clinical signs and symptoms improvement between heat groups and control groups.

Heat therapy had a positive effect in relieving pain, stiffness, and improving physical functions such as every day and leisure activities. As a result, it may be the preferred technique for addressing patients with KOA in terms of non-pharmacological methods. Heat compresses are a non-invasive and generally safe means of reducing pain, morning stiffness, and improving physical activities.

## 6. Recommendations:

The current study indicated that researchers investigate the effect of physical exercises on pain relief, morning stiffness, and physical activity improvement in individuals with OA. More researches are required to acquire a more complete understanding of the comparative effects of heat therapy and exercise combined on pain and physical function in persons with knee OA.

**Table (1): Distribution of both studied groups regarding to their demographic characteristics (n=40)**

| demographic characteristics | Heat (G1) n=40 | | Control (G2) n=40 | | X² test | P-value |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| **Age** | | | | | | |
| 20:<30 | 0 | 0 | 0 | 0 | 20.86 | **.008*** |
| 30:<40 | 10 | 25 | 12 | 30.0 | | |
| 40:<50 | 30 | 75.0 | 28 | 70 | | |
| **Gender** | | | | | | |
| Male | 12 | 30.0 | 10 | 25.0 | .251 | .882 |
| Female | 28 | 70.0 | 30 | 75.0 | | |
| **Marital status** | | | | | | |
| Married | 37 | 92.5 | 32 | 80.0 | 10.51 | .105 |
| Single | 0 | 0 | 0 | 0 | | |
| Divorced | 1 | 2.5 | 1 | 2.5 | | |
| Widowed | 2 | 5.0 | 7 | 17.5 | | |
| **Educational level** | | | | | | |
| Illiterate | 8 | 20.0 | 20 | 50.0 | 41.50 | **<.001*** |
| Read and write | 2 | 5.0 | 5 | 12.5 | | |
| Primary | 2 | 5.0 | 0 | 0 | | |
| Secondary | 18 | 45.0 | 12 | 30.0 | | |
| High | 10 | 25.0 | 3 | 7.5 | | |
| **Job** | | | | | | |
| Working | 25 | 62.5 | 22 | 55.0 | 2.60 | .271 |
| Not working | 15 | 37.5 | 18 | 45.0 | | |
| **Type of work** | **n=25** | | **N=22** | | | |
| Official | 5 | 20 | 4 | 10.0 | .251 | .254 |
| Moderate effort | 17 | 68 | 17 | 42.5 | | |
| With lifting load | 3 | 12 | 1 | 2.5 | | |
| **Residence** | | | | | | |
| Rural | 29 | 72.5 | 28 | 70.0 | .714 | .700 |
| Urban | 11 | 27.5 | 12 | 30.0 | | |

**X2 is Chi Square test; p value is significant <.05**

**Table (2): Distribution of both studied groups regarding to the present and past history of osteoarthritis (n=40).**

| The present and past history | Heat(G1) n=40 | | Control (G2) n=40 | | X²- test | p-value |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| **Duration of osteoarthritis** | | | | | | |
| <5y | 23 | 57.5 | 24 | 60.0 | 5.02 | .285 |
| 5:10 y | 15 | 37.5 | 12 | 30.0 | | |
| >10y | 2 | 5.0 | 4 | 10.0 | | |
| **Knee affected** | | | | | | |
| Right | 11 | 27.5 | 16 | 40.0 | 7.27 | .122 |
| Left | 15 | 37.5 | 4 | 10.0 | | |
| Both | 14 | 35.0 | 20 | 50.0 | | |
| **Other chronic diseases** | | | | | | |
| Hypertension | 19 | 47.5 | 16 | 40.0 | 3.80 | 0.703 |
| DM | 2 | 5.0 | 6 | 15.0 | | |
| Liver | 1 | 2.5 | 0 | 0 | | |
| Others | 3 | 7.5 | 1 | 2.5 | | |
| No | 15 | 37.5 | 17 | 42.5 | | |
| **Family members suffering from OA** | | | | | | |
| Yes | 20 | 50.0 | 14 | 35.0 | 1.87 | .392 |
| No | 20 | 50.0 | 26 | 65.0 | | |
| **If yes mention** | n=20 | | N=14 | | | |
| Father | 4 | 10.0 | 1 | 2.5 | 2.09 | .251 |
| Mother | 14 | 35.0 | 11 | 27.5 | | |
| Brother | 1 | 2.5 | 1 | 2.5 | | |
| Sister | 1 | 2.5 | 1 | 2.5 | | |
| **BMI** | | | | | | |
| Weight (Mean ± sd) | 92.28±13.62 | | F (3.99) | | **.021*** | |
| Length (Mean±sd) | 162.43±5.69 | | F (4.22) | | **.018*** | |
| BMI (Mean±sd) | 35.12±5.90 | | F (1.35) | | .263 | |

**X2 is chi-square test; F is one-way anova test; P value is significant <.05**

**Table (3): Distribution of both studied groups regarding to signs and symptoms of osteoarthritis and stiffness criteria (stiffness) (n=40).**

| Signs and symptoms | Heat (G1) n=40 | | Control (G2) n=40 | | X² test | P-value |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| The total number is different from the numbers below due to the possibility of the same person having more than one symptom | | | | | | |
| **Signs and symptoms** | | | | | | |
| Joint pain | 32 | 80 | 39 | 97.5 | | |
| Stiffness | 13 | 32.5 | 23 | 57.5 | | |
| Limitation | 26 | 65 | 24 | 60 | | |
| Crepitus | 31 | 77.5 | 32 | 80 | 3.41 | 0.304 |
| Edema | 7 | 17.5 | 8 | 20 | | |
| Insomnia | 16 | 40 | 31 | 77.5 | | |
| Redness | 0 | 0 | 0 | 0 | | |
| Squeeze | 6 | 15 | 8 | 20 | | |
| **Time of stiffness start** | | | | | | |
| Morning | 16 | 40.0 | 22 | 55.0 | | |
| Afternoon | 2 | 5.0 | 8 | 20.0 | | |
| After activity | 15 | 37.5 | 3 | 7.5 | 22.69 | **.012*** |
| After rest | 4 | 10.0 | 5 | 12.5 | | |
| Morning and after rest | 1 | 2.5 | 2 | 5.0 | | |
| Afternoon and after activity | 2 | 5 | 0 | 0 | | |
| **Duration of stiffness** | | | | | | |
| Continuous | 6 | 15.0 | 13 | 32.5 | | |
| Sometimes | 18 | 45.0 | 17 | 42.5 | 8.12 | .229 |
| For fifteen minutes | 10 | 25.0 | 9 | 22.5 | | |
| For thirteen minutes | 5 | 12.5 | 1 | 2.5 | | |
| **Method of reliving stiffness** | | | | | | |
| Tab | 22 | 55 | 23 | 57.5 | | |
| Injection | 1 | 2.5 | 0 | 0 | | |
| Hot compresses | 18 | 45 | 20 | 50 | | |
| Physiotherapy | 17 | 42.5 | 31 | 77.5 | 10.66 | 0.954 |
| Diet therapy | 7 | 17.5 | 17 | 42.5 | | |
| Exercise | 1 | 2.5 | 0 | 0 | | |
| Local | 7 | 17.5 | 0 | 0 | | |

**\*Is multiple response question, X2 is chi-square test; P. value is significant <.05**

**Table (4): Distribution of both studied groups regarding to osteoarthritis pain characteristics (n=40).**

| Pain characteristics | Heat (G1) n=40 | | Control (G2) n=40 | | X² test | P-value |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| **Pain duration** | | | | | | |
| 15 ≤ 30 mins | 29 | 72.5 | 29 | 72.5 | 9.39 | .138 |
| 30 mins ≤ 1 hour | 9 | 22.5 | 5 | 12.5 | | |
| 1 hour ≤ 2hours | 2 | 5.0 | 6 | 15.0 | | |
| **Pain characteristics** | | | | | | |
| Burning | 6 | 15 | 6 | 15 | 17.84 | 0.715 |
| Piercing | 7 | 17.5 | 21 | 52.5 | | |
| Pulsatile | 4 | 19 | 8 | 20 | | |
| Acute stabbing | 2 | 5 | 0 | 0 | | |
| Squeezing | 16 | 40 | 0 | 0 | | |
| Constant | 3 | 7.5 | 3 | 7.5 | | |
| Scattered | 6 | 15 | 8 | 20 | | |
| Severe | 2 | 5 | 5 | 12.5 | | |
| **Pain onset** | | | | | | |
| Continuous | 3 | 7.5 | 2 | 5.0 | .303 | .859 |
| Intermittent | 37 | 92.5 | 38 | 95.0 | | |
| **Pain time** | | | | | | |
| Morning | 5 | 12.5 | 6 | 15.0 | 15.11 | .128 |
| Evening | 3 | 7.5 | 5 | 12.5 | | |
| Before sleeping | 1 | 2.5 | 2 | 5.0 | | |
| During sleeping | 2 | 5.0 | 1 | 2.5 | | |
| All the time | 4 | 10.0 | 14 | 35.0 | | |
| With movement (upstairs & down stairs) | 25 | 62.5 | 12 | 30.0 | | |

X2 is chi-square test; P. value is significant <.05

**Table (5): Comparison of both studied groups regarding total mean scores of stiffness pre and post heat therapy (n=40)**

| Morning stiffness | Heat G1. (n=40) | Control G2. (n=40) | T (P. value) (η2) |
|---|---|---|---|
| | Mean ±SD | Mean ±SD | |
| Pre | 48.75±9.03 | 47.05±9.59 | NS |
| Post | 65.71±6.81 | 49.82±11.23 | 39.38 (<.001*) (.40) |

**t is paired sample t- test; d² is Cohen's d effect size P value is significant <.05*;**

**Table (6): Comparison of both studied groups regarding to total mean scores of pains pre and post heat therapy (n=40)**

| Total pain scores | Heat G.1 (n=40) | Control G.2(n=40) | T (P value) (η2) |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| Pre | 48.40±9.66 | 51.18±10.45 | NS |
| Post | 88.19±5.40 | 55.07±10.24 | 106.60 (<.001*) (.65) |

**t is paired sample t test; d² is Cohen's d effect size P value is significant <.05***

**Table (7): Comparison of both studied groups regarding to total levels of signs and symptoms pre and post heat therapy (n=40).**

| Total signs and symptoms | Heat G1.(n=40) | | | | Control G2.(n=40) | | | | Pre | Post |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pre | | Post | | Pre | | Post | | | |
| | N | % | N | % | N | % | N | % | | |
| Extreme | 2 | 5.0 | 0 | 0 | 2 | 5.0 | 2 | 5.0 | (.965) | (<.001*) |
| Moderate | 36 | 90.0 | 18 | 45.0 | 36 | 90.0 | 34 | 85.0 | mc | mc |
| Mild | 2 | 5.0 | 22 | 55.0 | 2 | 5.0 | 4 | 10.0 | | |

**mc is mont carlo chi-sqaure test chi-square test; P value is significant <.05**

## 7. References

**Abd Allah, E., Abdou-Aly, S., Hagrass and Hassanin A. (2017).** Effect of Lifestyle Modification Intervention Program among Adults Suffering from Osteoarthritis knee. IOSR Journal of Nursing and Health Science (IOSR-JNHS), 6 (1), 01-08.

**Abd elFatah, M. I., Weheida, S. M., and Mekkawy, M. M. (2019).** Effect of Cold Application Versus Contrast Hydrotherapy on Patients Knee Osteoarthritis Outcomes. American Journal of Nursing, 8(4), 145-152.

**Abd Elstaar, T.E., Salamab, A.A., Esailyc, H.G. and Boltyb, S.A. (2016).** Quality of life in patients with primary knee osteoarthritis. Menoufia Medical Journal, 29, 111– 114.

**Aciksoz, S., Akyuz, A., & Tunay, S. (2017).** The effect of self-administered superficial local hot and cold application methods on pain, functional status and quality of life in primary knee osteoarthritis patients. Journal of clinical nursing, 26 (23-24), 5179–5190.

**Alkan, B.M., Fidan, F., Tosun, A. and Ardıcoğlu, O. (2017).** Quality of life and self-reported disability in patients with knee osteoarthritis. Mod Rheumatol, 24 (1), 166–171.

**Al-Khlaifat, L., Herrington, L. C., Tyson, S. F., Hammond, A., & Jones, R. K. (2016).** The effectiveness of an exercise program on dynamic balance in patients with medial knee osteoarthritis: A pilot study. The Knee, 23(5), 849–856.

**Archanah, T., Shashikiran, H. C., Shetty, P. and Chandrakanth, K. K. (2018).** Effect of a hydrotherapy based alternate compress on osteoarthritis of the knee joint: a randomized controlled trial. Int J Res Med Sci, 6 (4), 1444- 1449.

**Ariana, M., Afrasiabifar, A., Najafi Doulatabad, S., Mosavi, A., & Behnammoghadam, M. (2022).** The Effect of Local Heat Therapy versus Cold Rub Gel on Pain and Joint Functions in Patients with Knee Osteoarthritis. *Clinical nursing research*, *31*(6), 1014–1022.

**Azma, K., RezaSoltani, Z., Rezaeimoghaddam, F., et al. (2018).** Efficacy of tele-rehabilitation compared with office-based physical therapy in patients with knee osteoarthritis: A randomized clinical trial. Journal of telemedicine and telecare, 24(8), 560-565.

**Basuny, N., Zatton, H., and Abo-Hashem, M. (2020).** Responsiveness ofpain and associated health issues of patients with knee osteoarthritis to the revulsive

compresses, Egyptian Journal of Health Care, EJHC, 11 (3), 114-143

**Bennell, K. L., Nelligan, R. K., Rini, C., et al. (2018).** Effects of internet-based pain coping skills training before home exercise for individuals with hip osteoarthritis (HOPE trial): a randomised controlled trial. Pain, 159(9), 1833-1842.

**Cui, A., Li, H., Wang, D., Zhong, J., Chen, Y., Lu, H. (2020).** Global, regional prevalence, incidence and risk factors of knee osteoarthritis in population-based studies. E-Clinical Medicine, 29, 100587.

**Davis, G.C. and Atwood, J.R. (2015).** The development of the pain management inventory for patients with arthritis. Journal of advancednursing,24, 236- 2424.

**Deshpande, B. R., Katz, J. N., Solomon, D. H., et al. (2016).** Number of persons with symptomatic knee osteoarthritis in the US: impact of race and ethnicity, age, sex, and obesity. Arthritis care & research, 68(12), 1743-1750.

**Elsiwy, Y., Jovanovic, I., Doma, K., et al. (2019).** Risk factors associated with cardiac complication after total joint arthroplasty of the hip and knee: a systematic review. Journal of Orthopaedic surgery and research, 14(1), 1-12.

**Flaxman, T. E., Alkjær, T., Simonsen, E. B., et al. (2017).** Predicting the Functional Roles of Knee Joint/" Muscles from Internal Joint Moments. Medicine and science in sports and exercise, 49(3), 527-537.

**Fransen, M., McConnell, S., Harmer, A. R., et al. (2015b).** Exercise for osteoarthritis of the knee: a Cochrane musculoskeletal disorders, 19(1), 1-16.

**Ghaleb, M.A. (2015).** Effective of supportive group program of self- care patterns for patients with rheumatoid arthritis in Alexandria. Unpublished doctorate thesis, faculty of Nursing, Alexandria University. pp. 97- 105.

**Hamood, R., Tirosh, M., Fallach, N., Chodick, G., Eisenberg, E., & Lubovsky, O. (2021).** Prevalence and Incidence of Osteoarthritis: A Population-Based Retrospective Cohort Study. Journal of clinical medicine, 10(18), 4282.

**Haq, S.A. and Davatchi, F. (2015).** Osteoarthritis of the knees in the COPCORD world. International Journal of Rheumatic Diseases; [PubMed: 21518310], 14,122–129.

**Hatefi, M., Parvizi, R., Borji, M., & Tarjoman, A. (2019).** Effect of Self-Management Program on Pain and Disability Index in Elderly Men with

Osteoarthritis. Anesthesiology and Pain Medicine, 9(4):e92672

**Ibrahim, K.A.M. (2017).** Quality of life among older adults with arthritis attending the outpatient clinics in Benha hospitals, Unpublished doctorate thesis, Faculty of Nursing, Benha University, p. 95.

**İnan, Ç., and Kıyak, E. (2014).** The effect of hot and cold application on pain, stiffness and physical function in patients with knee osteoarthritis. HEMAR-G, 16(2), 1-10.

**Iwamoto, J., Sato, Y., Takeda, T., et al. (2011).** Effectiveness of exercise for osteoarthritis of the knee: A review of the literature. World journal of orthopedics, 2(5), 37.

**Jakobsson, U. and Hallberg, R.H. (2015).** Pain and quality of life among older people with rheumatoid arthritis or osteoarthritis: A literature review. J Clin Nurs, 11, 430-443.

**Jebakani, D. B., Sethu, G., Pahinian, A., et al. (2015).** Effects of therapeutic exercises on pain and physical disability in adults with knee osteoarthritis. Asian Journal of Scientific Research, 8(1), 74-79.

**Jordan, K.M., Arden, N.K., Doherty, M., Bannwarth, B., Bijlsma, J.W.J. and Dieppe, P. (2015).** EULAR Recommendations: an evidence-based approach to the management of knee

osteoarthritis: report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). Annals of the Rheumatic Diseases; 62(12): pp.1145-1155.

**Lievense, A., Bierma-zeinstra, S., Verhagen, A., Bernsen, M., Verhaar, J. and Koes, B. (2017).** Influence of sporting activities on thedevelopment of osteoarthritis of the hip: A systematic review. Arthritis care Res, 49(1), 228-36.

**Martel-Pelletier, J., Barr, A. J., Cicuttini, F. M., et al. (2016).** Osteoarthritis. Nat Rev Dis Primers, 2, 16072.

**McAlindon, T. E., and Bannuru, R. R. (2018).** Latest advances in the management of knee OA. Nature Reviews Rheumatology, 14(2), 73-74.

**Mezey, G. A., Máté, Z., & Paulik, E. (2022).** Factors Influencing Pain Management of Patients with Osteoarthritis: A Cross-Sectional Study. Journal of clinical medicine, 11(5), 1352.

**Misra, D., Fielding, R. A., Felson, D. T., Niu, J., Brown, C., Nevitt, M., Lewis, C. E., Torner, J., Neogi, T., & MOST study (2019).** Risk of Knee Osteoarthritis with Obesity, Sarcopenic Obesity, and Sarcopenia. Arthritis & rheumatology

(Hoboken, N.J.), 71(2), 232–237.

**Mohamed, A. (2018).** The effect of self- care on lifestyle of patients with early osteoarthritis knee, unpublished doctorate thesis, Faculty of Nursing, Ain Shams University, p. 97.

**Mohamed, H. G., and Mohamed, M. A. F. (2019).** Effect of local heat therapy on complaints of patients with moderate knee osteoarthritis. American Journal of Nursing Research, 7(2),148-159

**Murphy, S.L., Janevic, M.R., Lee, P. and Williams, D.A. (2018).** Occupational therapist-delivered cognitive- behavioral therapy for knee osteoarthritis: A randomized pilot study. Am J Occup Ther,72 (5), 1-9.

**NIH. (2016).** National Institute of Arthritis and Musculoskeletal and Skin Diseases. Handout on Health: Systemic Lupus Erythematosus. Available at: http://www.niams.nih.gov/health_info/osteoarthritis/. Retrieved June, 6, 2020.

**O'Neill, T.W., McCabe, P.S., and McBeth, J. (2018).** Update on the epidemiology, risk factors and disease outcomes of osteoarthritis. Best practice & research Clinical rheumatology, 32(2), 312-326.

**Palazzo, C., Nguyen, C., Lefevre-Colau, M., Rannou, F., Poiraudeau, S. (2016).** Risk factors and burden of osteoarthritis. Annals of

Physical and Rehabilitation Medicine, 59(3): 134-138.

**Plotnikoff, R., Karunamuni, N., Lytvyak, E., Penfold, C., Schopflocher, D., Imayama, I., Johnson, S. T., & Raine, K. (2015).** Osteoarthritis prevalence and modifiable factors: a population study. BMC public health, 15, 1195.

**Raj, J. R. and Mol, S.V. (2017).** Effect of revulsive compress on knee associated symptoms among knee joint osteoarthritis patients, International Journal of Current Research, 9 (12), 63313- 63315.

**Ramadan, R.M.E., Ali, J.S., Aboushady, R.M. (2016).** Impact of physical exercise on daily living activities among women with early osteoarthritis. Egypt Nurs J, 13(3),186-92

**Roos, E.M., Lohmander, L.S. (2003).** The Knee injury and Osteoarthritis Outcome Score (KOOS): from joint injury to osteoarthritis. Health Qual Life Outcomes, 3(1), 64.

**Saffari M., Emami, Meybodi, M.K., Sanaeinasab, H., Karami, A., Pakpour, A.H. and Koenig, H.G. (2018).** A theory of planned behavior-based intervention to improve quality of life in patients with knee/hip osteoarthritis: A randomized

controlled trial. Clin Rheumatol, 37(9), 2505-15.

**Shafii, N. A. H. N., Yaacob, L. H., Ishak, A., et al. (2018).** Traditional and complementary medicine use in knee osteoarthritis and its associated factors among patients in northeast peninsular Malaysia. Oman medical journal, 33(2), 148.

**Shehata, A.E. and Fareed, M.E. (2018).** Effect of cold, warm or contrast therapy on controlling knee osteoarthritis associated problems. Int J Med Health Pharm Biomed Eng, 7,259-65.

**Shin, D. (2017).** Association between metabolic syndrome, radiographic knee osteoarthritis, and intensity of knee pain: results of a national survey.J Clin Endocrinol Metab, 99, 3177–83.


**Silverwood, V., Blagojevic-Bucknall, M., Jinks, C., et al. (2015).** Current evidence on risk factors for knee osteoarthritis in older adults: a systematic review and meta-analysis. Osteoarthritis and cartilage, 23(4), 507-515.

**Singh, J. A., Noorbaloochi, S., MacDonald, R., et al. (2015).** Chondroitin for osteoarthritis. Cochrane Database of Systematic Reviews *1*(1), CD005614. https://doi.org/10.1002/14651858.CD005614.pub2

**Songül, K., Sultan, T., Nurhan, D., Hüseyin, D., Züleyha, K. (2019).** Applicat ion of heat and a home exercise program for pain and function levels in patients with knee osteoarthritis: A randomized controlled trial. International Journal of Nursing Practice, 25 (5), e12772.

**Springer, B. D. (2019).** Management of the bariatric patient. What are the implications of obesity and total joint arthroplasty: the orthopedic surgeon's perspective? The Journal of Arthroplasty, 34(7), S30-S32.

**Tan, J. S., Tikoft, E., O'Sullivan, P., Smith, A., Campbell, A., Caneiro, J. P., & Kent, P. (2021).** The Relationship Between Changes in Movement and Activity Limitation or Pain in People With Knee Osteoarthritis: A Systematic Review. The Journal of orthopaedic and sports physical therapy, 51(10), 492–502.

**Tan, T. C., Gao, X., Thong, B. Y., Leong, K. P., Lian, T. Y., Law, W. G., Kong, K. O., Howe, H. S., Chng, H. H., Koh, E. T., & TTSH Rheumatoid Arthritis Study Group (2017**). Comparison of elderly- and young-onset rheumatoid arthritis in an Asian cohort. International journal of rheumatic diseases, 20(6), 737–745.

**Thijssen, E., Caam, A.V., Peter, M. Kraan, V.D. (2015).** Obesity and osteoarthritis, more than just wear and tear: pivotal roles for

inflamed adipose tissue and dyslipidaemia in obesity-induced osteoarthritis. Rheumatology; **54 (4): 588–600.**

**Thombson, S. (2012).** Sampling. 3rd edition, John Willy & Sons.Inc., Hobcon, New Jersy, Canada ©. Pp. 250-260.

**Uludağ, E., and Kaşikçi, K. (2019).** The effect of local cold compression upon pain and movement restriction among patients with knee osteoarthritis. Austin J Nurs Health Care, 6(1), 1048.

**Ulusoy, F. and Yıldırım, N. (2018).** The Effect of Hot Practice on Pain, Detention, Daily Physical Activities and Quality of Life in Patients with Knee Osteoarthritis. Hacettepe University, Institute of Health Sciences

**Usenbo, A., Kramer, V., Young, T. and Musekiwa, A. (2015).** Prevalence of Arthritis in Africa: A Systematic Review and Meta-Analysis. PLOS ONE | DOI: 10.1371/journal.

**van de Stadt, L. A., Haugen, I. K., Felson, D., & Kloppenburg, M. (2023).** Prolonged morning stiffness is common in hand OA and does not preclude a diagnosis of hand osteoarthritis. *Osteoarthritis and cartilage*, *31*(4), 529–533. https://doi.org/10.1016/j.joca.2022.10.022

**Vina, E. R., & Kwoh, C. K. (2018).** Epidemiology of osteoarthritis: literature update. Current opinion in rheumatology, 30(2), 160–167.