

Effect of cold rub gel, warm Versus Contrast Therapy on pain and joint function in Patients with Knee Osteoarthritis

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Abstract

Background: When it comes to arthritis, osteoarthritis (OA), which can be characterized as a degenerative condition affecting the synovial joint, is by far the most prevalent and crippling type. When moving, people with osteoarthritis frequently experience a dull aching sensation. Physical remedies like warm or cold treatment, when used properly, can aid in easing the uncomfortable process. **Aim:** This study's objective was to compare how cold rub gel, warm therapy, and contrast therapy affected knee osteoarthritis patients with knee osteoarthritis who were experiencing pain and joint function. **Design:** A quasi-experimental comparative research methodology was utilized to accomplish the study's objective. **Setting:** The study was conducted at the Helwan General Hospital in Egypt's orthopedic outpatient clinic. The research was carried out at Orthopedic outpatient clinic, Helwan General Hospital, Egypt. **Sample:** The purposive sample consisted of 60 adult patients with unilateral knee osteoarthritis. **Tools:** Four distinct instruments were used to obtain the data. Item 1: An interview questionnaire. Knee Injury and Osteoarthritis Outcome Scale, or KOOS. Tool III: A 0–10 scale for rating pain. Checklist for observations, or tool IV. **Results:** showed that the total score for knee problems decreased from moderate to mild after applying the cold rub gel, warm, and contrast technique of therapy. Contrast therapy, however, was significantly more effective than the alternative treatments at reducing knee symptoms and pain and enhancing joint function. **Conclusions:** All of the knee pain and symptoms improved after using any one of the three therapeutic approaches, although contrast therapy was the most effective approach for doing so. **Recommendation:** According to the study, contrast therapy is the most efficient kind of treatment for people with knee osteoarthritis who are experiencing knee pain and symptoms.

Keyword: cold rub gel, warm therapy, contrast therapy, knee osteoarthritis.

Introduction.

Over 20 million Americans suffer from osteoarthritis (OA), the most widespread illness. 15% of all musculoskeletal consults for people over 45 are for osteoarthritis. Knee osteoarthritis affects more than 10 million people in the United States. Additionally, it is the leading contributor to disabilities in the country. (William C and Shiel JR, 2017) 5,596,869 people in Egypt, or around 1.2 percent of the population, have osteoarthritis. (Statistics by country for osteoarthritis, 2019). Knees, hips, and hands are among the weight-bearing joints that are impacted by osteoarthritis. A frequent and deteriorating ailment, osteoarthritis of the knee. 6% of adults are said to experience this. With each decade of life, the prevalence of knee osteoarthritis rises, making it clinically significant (Michael et al., 2020).

It may be categorized as primary or secondary depending on its underlying causes or risk factors. In contrast to genetic

predisposition, the main (idiopathic) type is the most prevalent and lacks any known causes. Secondary OA is known to be brought on by a number of illnesses. Four general categories can be used to classify them: traumatic (fractures and sprains), inflammatory (ankylosing spondylitis and septic arthritis), metabolic (calcium crystal deposition and acromegaly), anatomic (leg length inequality and congenital hip dislocation). (Pellino et al., 2021).

Patients with osteoarthritis sometimes lament a dull ache pain that comes on as soon as they start moving. The joint's functionality is significantly compromised as osteoarthritis worsens, and the pain becomes constant. (Michael et al., 2020). The most significant problem affecting daily living, according to community members, is chronic pain. For fear of making their suffering worse, many choose to stay away from activity. Additionally, individuals with knee OA frequently exhibit joint stiffness, soreness, crepitus, joint

enlargement, deformity, muscle weakness, a restriction in joint motion, poor proprioception, and impairment. Patients' ability to move around, climb stairs, enter and exit a car, and/or feel instability or buckling of the joints while seated in a chair due to weakness of the thigh muscles may seriously affect their capacity to carry out everyday tasks. (Chen, 2020 and Tsao et al., 2021).

The process by which the illness develops and spreads is still not fully known, hence it cannot be cured. The purpose of treatment is to lessen the symptoms and indicators of the disease and, if possible, to demonstrate its progression. Patients with osteoarthritis of the knees have a variety of treatment choices, including as applying superficial heat or cold, managing weight, exercising, receiving oral medication, getting corticosteroid injections, and ultimately having knee replacement surgery. (Cetin et al., 2021 and Zhang et al., 2022).

When compared to certain therapies, including applying warm or cold to the skin, medication and surgery do include some dangers and side effects. Additionally, not all treatment choices yield the same results, supporting individualized patient management techniques; the advantages of others; They must be repeated because some treatments, like corticosteroid injections, do not last forever. A typically risk-free, inexpensive treatment that can be used alone or in conjunction with other therapies is the routine application of cold or heat on the skin. One approach is contrast therapy, which includes applying cold and then warm in succession on a regular basis. In the treatment of numerous different musculoskeletal disorders, such as knee OA, it provides an alternate choice (Oosterveid F. And Rasker J, 2021 and Soo Hoo et al., 2022).

While cold can numb the pain, reduce swelling, restrict blood vessels, and block nerve impulses to the joint, warmth can aid in circulation and muscle relaxation, so reducing discomfort (Brosseau et al., 2019). Warm or cold compresses, ultrasonography for heat modalities, warm or cold baths or showers, and heating pads for heat remedies are the typical sources of warm and/or cold therapy. (Berarducci A, 2019).

Applying the conservative osteoarthritis treatment approach, such as thermotherapy, cryotherapy, or contrast therapy, the nurse plays a significant role in delivering the best patient care. The nurse should work alongside the patient throughout the application of therapy, starting with preparation, application over the afflicted joints, and ongoing monitoring for the patient's tolerance of the process and any skin or systemic reactions. The nurse should also instruct the patient on how to administer these treatments on their own (Dowall T, 2020).

There isn't much research showing whether a type of therapy is more beneficial—colder, warm, or contrast—and there are no definitive conclusions or patient instructions, in order to compare the effects of warm, cold, and contrast therapy methods on pain and joint function in patients with knee osteoarthritis, that was the study's main objective.

Significance. of. the. study

5,596,869 people in Egypt have osteoarthritis, making it the most prevalent disease there. (Statistics by the country for osteoarthritis, 2019). An increasingly common issue is knee osteoarthritis pain. Clinically severe knee osteoarthritis affects 6% of adults, and that number is increasing with each passing decade, according to statistics (Michael et al., 2020). Numerous patients are admitted to orthopedic outpatient clinics, rehabilitation units, and departments of orthopedics and physiotherapy, according to observations. Knee osteoarthritis patients at Helwan General Hospital report joint pain, edema, and difficulty doing daily tasks. Warm or cold therapy, or contrast therapy, is frequently used as an adjuvant to medical care or as a post-operative procedure, may help alleviate the patients' concerns, offer them quick, safe, low-effort, and affordable treatment alternatives for their ailments, and offer evidence-based nursing practice that directs nurses in dealing with such issues.

Aim. of. the. study

The study's goal was to compare the effects of warm therapy vs contrast therapy on patients with knee osteoarthritis who were experiencing pain and joint function.

Research. Hypotheses

The following research hypotheses were created to fulfil the study's objective:

1. After informing the patients about these three treatment options, the pain and osteoarthritis condition in the knee will improve.
2. In comparison to warm or cold therapy, contrast therapy will be more successful at reducing pain and improving knee joint function.

Operational. definitions:

One method that includes repeatedly applying cold and then applying warm in an alternate manner is **contrast therapy**.

Patient'. joint. function. And. pain: It discussed the results of knee osteoarthritis treatment; better patient compliance with the three modes of therapy had a favorable impact on pain and osteoarthritis issues.

Subjects. and. Method

1. Subjects

Design: The goal of the study was achieved using a quasi-experimental comparative research design.

Setting: The study was conducted in the Helwan General Hospital's orthopedic outpatient clinics.

Subjects: A purposefully selected cohort of 60 adult patients with unilateral knee osteoarthritis includes:

Inclusion. criteria:

Both sexes who are willing to participate in the trial and who have never had a hip or knee replacement or any orthopedic surgery on the knee that is affected, not having received a knee corticosteroid injection within the last six months, as well as not having any metal implants, a pacemaker, cardiac conditions that impact local circulation, or any other such conditions the area around the knees is free from weakened feeling of heat or cold.

Sample size: The Helwan General Hospital's orthopedic outpatient clinics, which are

Considered as reference facilities for cases of knee osteoarthritis, were where the subjects of our study were selected. 3900 instances of knee osteoarthritis were seen annually in the outpatient orthopedic clinics at Helwan General Hospital. 80 percent of the sample size, with power, was 87 instances, only 60 of the 87 participants who met the criterion for selection agreed to follow all three treatment regimens, while 27 subjects declined to employ cold and contrast therapy. From the 87 subjects who met the criteria, we collected our data.

Part .one: Demographic .data. The patient's age, sex, marital status, degree of education, and occupation were all mentioned in the report.

Part. two: Medical .data. It had inquiries regarding vital signs, family history of osteoarthritis, BMI, and the reasons for the patient's hospital visit.

Part. three: The medication can have a number of unwanted side effects, including localized inflammation, redness, and heat.

Tool. II: Knee. injury. And. osteoarthritis outcome. score (KOOS): It came about thanks to (Roos and Lohmander, 2003) to determine how the patients feel about their knees and associated problems. The researchers used the English version and translated it afterward. Researchers adjusted the scoring system, which is now divided into the following five sections:

Part .one (pain): It included questions concerning knee pain throughout the preceding week, including how often and how bad the pain was. whether sitting or lying down, twisting, straightening, knee bending, walking, climbing stairs, being in bed at night, and standing straight up.

Part. two (other. symptoms): Its inquiries about any further symptoms you may have experienced over the past week, such as knee swelling, noises heard when you move your knee, hanging up of the knee when moving, and limitations on the knee's ability to fully straighten and bend. The frequency and severity of knee joint stiffness experienced in the past recent

Week, upon awakening, as well as later

throughout the day when sitting, lying, or resting, were also discussed.

Part. three (function.in. daily. living):

Whether it was difficult for you to get up from a chair, stand up, bend to pick something up off the floor, walk on a flat surface, or do other activities of daily living in the last week, is up to you. the act of entering and exiting a vehicle, going shopping, donning and removing socks, resting in and rising from a bed, entering and exiting a bathroom and performing light and laborious household chores.

Part. four (function.in. sport .and recreation):

Questions on how difficult it was for you to kneel, squat, run, leap, twist, and do other exercises in sports and leisure over the past week.

Part. five (knee-. related. quality. of. life):

Questions concerning how often people are aware of knee difficulties, whether lifestyles are changed to avoid potentially harmful behaviors, and how much knee pain they experienced in the previous week.

Scoring. system: Each question had a score between zero and four, with zero denoting no problems and four denoting severe problems, for the standardized answer alternatives, which were divided into five Likert boxes. The sum of the contained items was used to compute each of the five scores. Extreme knee symptoms are indicated by a total score of 144–186; moderate knee symptoms are indicated by a score of 100–143; light knee symptoms are indicated by a score of 56–99; and no knee symptoms are indicated by a score of less than 56.

Tool. III: 0-10. numeric. pain. rating. scale:

It came about thanks to (Mc Caffery and Beebe, 1993) to determine the severity of the pain. The researchers' scale, which was a 10 cm line with numbers ranging from 0 to 10, was translated as follows: 0 = no pain; 1-3 = mild pain; 4-6 = moderate pain; 7-10 = severe pain; disabling; unable to perform daily activities.

Tool. IV: Observational. checklist: The researchers came up with it to gauge how well the three therapy methods were being

used by the individuals. Seven statements made up the test, and the researchers had to determine whether or not the subjects had completed it, such as examining the knee's skin, determining the water's temperature, filling the pack halfway to two thirds full, eliminating air from the pack, inspecting it for leaks, covering the pack with a towel before application, and evaluating the skin's reaction to the pack once it has been put on.

Scoring. system: Each claim received a score of one if the action was performed successfully and zero if it was not performed at all or was performed improperly. A higher score denoted good practice, and the total score was added.

Operational .design

A pilot study, content validity and reliability, fieldwork, and planning phase are all included in the operational design.

A) Preparatory. phase:

Utilizing books, journals, and periodicals, involved evaluating pertinent literature and gaining a theoretical understanding of numerous study-related topics in order to create data-gathering instruments.

B) Tool. validity. and. reliability:

• Tool. Validity:

A test of the tool's validity was done to see if it satisfied the study's objectives. The tool was evaluated by a panel of seven specialists from Ain Shams and Helwan University, including three professors, three assistant professors, and one lecturer of medical surgical nursing. They checked the tool for validity in terms of its completeness, accuracy, clarity, and relevance. make tools for gathering data. The first and fourth tools were created by the researchers after they had read the pertinent literature; the second and third tools were created by Roos and Lohmander, and Mc Caffery and Beebe, respectively. The researchers translated Tools II and III into Arabic before 5 specialists in the domains of nursing and orthopedics evaluated each Tool's content validity. In order to ensure relevance and completeness, modifications were made when necessary.

Tool. Reliability:

In a pilot study, the produced tools' dependability was evaluated by utilizing Cronbach's alpha approach to gauge internal consistency. Using the test-retest methodology and the Pearson correlation coefficient formula, all instruments were evaluated. Tool 1 received an 8.7, Tool 2 and 8.9, Tool 3 a 9.1, and Tool 4 received a 7.8.

C) Pilot. study:

To assess the viability and applicability of the tools prior to the real study, a pilot study with 10% of the study sample (6 patients) was undertaken, and any necessary adjustments were then made. The current study did not use any of the pilot study's data

D) Field. work:

The study's three successive phases—interviewing and assessment, implementation, and evaluation—took place from the beginning of May 2023 to the end of July 2023. Each phase lasted three months.

The. interviewing. and. assessment. phase:

All participants were given a brief introduction by the researchers, who also went over the details of the study's objectives, the instruments' components, and the contrast therapy procedure. Every patient had to spend between 20 and 35 minutes completing the questionnaire, and after assuring them that their privacy would be protected throughout the research, each participant gave their verbal agreement.

The. implementation. phase:

By using a tool, I to conduct one-on-one interviews with each participant, the researcher started the data collection process by evaluating their medical and demographic information.

Using the knee injury and osteoarthritis outcome score (KOOS) (tool II), each participant's patients' perceptions of their knees and related issues were evaluated.

A 0–10 numeric pain rating scale (tool III) was used to evaluate each participant's level of pain.

Using tool IV (the observational checklist), all participants were observed for how well they had practiced all three treatment methods.

Each participant was asked to complete the three treatment procedures including cold rub gel, warm, and contrast (alternating cold and warm of one week; 7 days duration). Over layers of towels wrapped over the injured knee, the following treatments were given using bottles:

1. Consider the color, sensation, warmth, and changes in skin integrity such as a wound, edema, and bleeding while evaluating the skin's state where the bag is applied.
2. Use a bath thermometer (40–43°C) or measure the water's temperature via the inner wrist to determine the temperature for warm or contrast therapy.
3. Add water or cold rub gel to the bag to create a warm or cold therapeutic environment. Half to two thirds of the filling ought to be used.
4. To get rid of the air in the bag, open the aperture and place it on a level surface. Once the water has entered, shut the bag.
5. Check for leaks in the bag.
6. Use the towel-covered bag to put it to the knee that is having trouble. Frequently evaluate how the skins react to the applied bag. If it causes any negative effects, such as redness, discomfort, swelling, or soreness, remove it.
7. For five days straight, the treatment choices were applied twice daily (morning and evening), followed by two days with no treatment. Except for the contrast treatment, which consisted of four minutes of warmth followed by one minute without treatment and two minutes of cold rub gel, all treatments were applied twice daily for a total of 20 minutes. In a session of 21 minutes, this cycle was repeated three times.
8. Using the observational checklist (tool IV), the researchers evaluated each participant's practice for applying these therapies after one week from the start of the instruction and before practicing the three treatment procedures. They then corrected any incorrect practices and addressed any questions the participants had.
9. On the seventh day of each treatment procedure, each subject was evaluated for KOOS to measure how the knee problem

changed from week to week as a result of the treatment procedures. They were then evaluated for a 0–10 numeric pain rating scale three more times.

The. evaluation. phase:

Each participant was questioned regarding any adverse events associated with any of the three treatment methods after the results of all three treatments had been combined.

Administrative. and. Ethical considerations:

The study got the go-ahead. Patients who agreed to participate in the study were given a signed consent form after being informed of its nature and goal.

The director and nursing director of Helwan General Hospital provided the required approvals.

The Helwan University Faculty of Nursing's ethics committee provided the appropriate ethical permissions.

Patients were given assurances regarding the privacy of their medical records, and the researchers introduced themselves to the study participants before informing them that participation in the study was entirely voluntary and that they might discontinue at any moment.

Statistical. analysis:

1. 1. Using SPSS statistical programmed version II, data were gathered, tabulated, and statistically analyzed. There were conducted two different types of statistics: Descriptive information includes mean, percentage, number, and standard deviation.

2. Analytical:

- a. a. A T-test using numerical data to compare two groups.
- b. A paired T-test to compare how well one group's pre- and post-treatment interventions worked.

For comparing qualitative data between two or more groups, use the Friedman test (a. c.).

P-value was considered significant if less than 5%

Limitation:

The cold rub gel therapy was not preferred by the study sample, and many of them refused to use it, which led the researchers to reduce the number of participants and lengthen the time needed for data collection from the study sample.

Results

Table (1) showed that the study participants' average age was 54.21 ± 9.37 years. 75% of the study's sample, or three out of four, were women. Less than two thirds of them (60%) were housewives as far as occupation was concerned. According to the medical information, the average BMI was 36.64 ± 4.7 . A positive family history of osteoarthritis was present in just 10% of the group under study.

Table (2) found that the patients' practices for all items involving the three treatment methods had improved significantly. This table provides evidence in favor of #1.

Table (3) showed that the average overall Osteoarthritis and Knee Injuries Outcomes Score (KOOS) before and after cold therapy in the research sample showed that patients experienced mild knee problems. The overall score showed modest knee discomfort after warm and contrast therapy. Additionally, there was evidence that the total KOOS score before and after the three types of intervention differed statistically significantly.

Table (4) the total pain scores before and after the three types of treatments showed statistically significant variations.

Table (5) and figure (1) indicated that contrast therapy was significantly more effective than warm therapy or cold rub gel at decreasing the overall KOOS and pain scale. The table and graph below back up theory 2.

Table (6) presented that after using the warm therapy procedure, 35% of the investigated sample displayed redness. While none of them (0.0%) had any concerns about the cold or contrast therapy's negative effects.

Table (7) According to the study, the total KOOS score did not differ significantly between men and women. The total pain score with warm and contrast therapy did differ noticeably between them, but there were other

differences as well.

Table (1): Biodemographic characteristic distribution for the sample under study.

Demographic data	No=60	%
Age:		
Mean \pm SD	54.21 \pm 9.37	
Sex:		
Male	15	25.0
Female	45	75.0
Education:		
Illiterate	27	45
Basic education	9	15
Higher education	24	40
Occupation:		
Manual	17	28.3
Administrative	7	11.7
Housewife	36	60.0
Marital status:		
Married	50	83.3
Widowed	10	16.7
BMI:		
Mean \pm SD	36.64 \pm 4.7	
Reasons for visiting hospital		
Swelling and hotness	42	70.0
Difficult movement	18	30.0
Family history of osteoarthritis		
Yes	6	10.0
No	54	90.0

Table (2): distribution of the examined sample in accordance with their practice guidelines for a week's worth of practice

The observed items	Before the treatment procedures N=60		After the treatment Procedures N=60		Mc-Nemarand P-value
	No	%	No	%	
Assessing the skin					
Correct	0.0	0.0	30	50	> 0.001*
Incorrect	60	100	30	50	
Checking the temperature of the water					
Correct	0.0	0.0	42	70	> 0.0001*
Incorrect	60	100	18	30	
Filling the pack for one half to two thirds					
Correct	12	20	46	76.7	> 0.0001*
Incorrect	48	80	14	23.3	
Removing the air					
Correct	5	8.3	21	35	> 0.05*
Incorrect	55	91.7	39	65	
Checking the pack for leaks					
Correct	11	18.3	45	75	>0.0001*
Incorrect	49	81.7	15	25	
Covering the pack with a towel					
Correct	3	5	19	31.7	> 0.01*
Incorrect	57	95	41	68.3	
Assessing the skin' response					
Correct	17	28.3	59	98.3	> 0.001*
Incorrect	43	71.7	1	1.7	

Significant *

Table (3): Comparing the examined sample's pre-assessment total KOOS* score to the assessments conducted after applying cold rub gel, warmth, and contrast.

Total KOOS score	Mean \pm SD	T-test	P-value
Pre-total score			
Follow up 1(cold therapy)	131.22 \pm 21.18	10.37**	<0.0001
total score	107.17 \pm 26.16		
Pre-total score			
Follow up 2(warm therapy)	131.22 \pm 21.18	23.79**	<0.0001
total score	75.25 \pm 23.31		
Pre-total score			
Follow up 3(contrast therapy)	131.22 \pm 21.18	26.64**	<0.0001
total score	71.52 \pm 24.61		

KOOS*: Knee injury and osteoarthritis outcome score.

**Indicate significance differences.

The total means KOOS: score the mild knee symptoms.

Table (4): Compared to the post-cold, post-warm, and post-contrast evaluations, the examined sample's pre-assessment overall pain score.

Total pain score	Mean \pm SD	T-test	P-value
Pre-total score			
Follow up 1(cold therapy)	8.57 \pm 1.54	7.22*	<0.0001
total score	7.57 \pm 1.94		
Pre-total score			
Follow up 2(warm therapy)	8.55 \pm 1.52	20.73*	<0.0001
total score	5.31 \pm 1.94		
Pre-total score			
Follow up 3(contrast therapy)	8.54 \pm 1.52	31.66*	<0.0001
total score	3.44 \pm 1.52		

*Indicate significance differences.

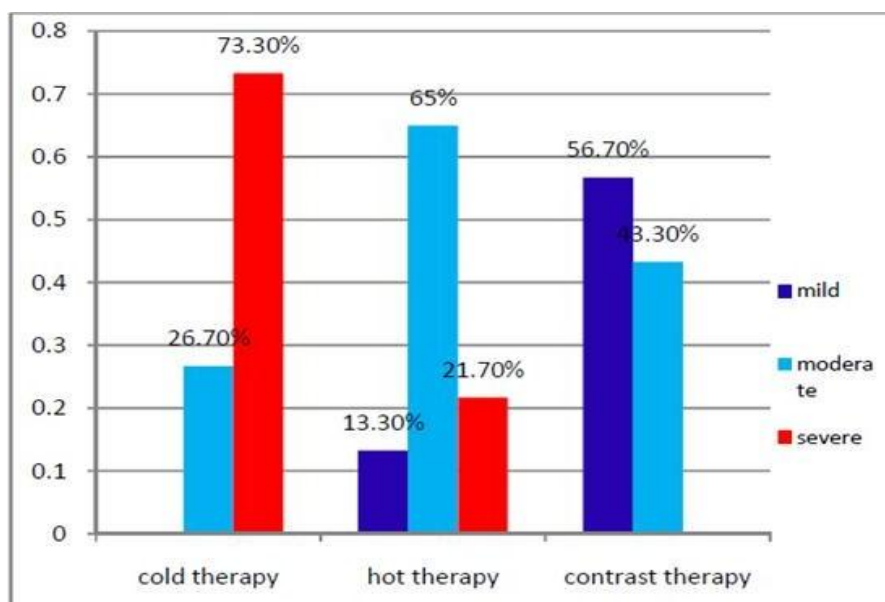
**Figure (1):** after applying cold rub gel, warm therapy, and contrast therapy, the sample under examination's percentage distribution of pain severity.

Table (5): The sample being studied for the efficacy of cold, warm, and contrast therapy received total KOOS * and pain scores.

variables	Cold rub gel therapy	Warm therapy	Contrast therapy	Friedman test (X ²)	p-Value
	Mean ±SD	Mean ±SD	Mean ±SD		
Total KOOS score	109.15±28.19	76.26±23.31	72.52±23.58	91.96	<0.0001**
Total pain score	7.54±1.92	5.34±1.92	3.47±1.53	114.24	<0.0001**

*KOOS: Knee injury and osteoarthritis outcome score.

**Indicate significance differences.

Table (6): Comparison of the side effects on the examined sample of using cold rub gel, warm therapy, and contrast therapy.

Quality of life domains	Cold rub gel therapy (No=60)		Warm therapy (No=60)		Contrast therapy (No=60)		X ²	P-value
	No	%	No	%	No	%		
Redness	0.0	0.0	21	35.0	0.0	0.0	27.2	<0.0001*
Hotness	0.0	0.0	2	3.3	0.0	0.0		
No	60	100	37	61.7	60	100		

*Indicate significance differences.

Table (7): Comparison of the side effects on the examined sample of using cold rub gel, warm therapy, and contrast therapy.

Variables	Male	Female	T-test	P-Value
Total KOOS score	Mean ±SD	Mean ±SD		
Pre-total KOOS score	124.07±22.93	134.12±18.68	1057	>0.05
Follow up 1 (cold) totalKOOS score	106.72 ±20.76	109.96±27.90	0.44	>0.05
Follow up 1 (warm) totalKOOS score	72.05±18.68	76.34±24.78	0.68	>0.05
Follow up 1 (contrast) totalKOOS score	64.42±16.54	71.24±26.63	1.21	>0.05
Total pain score	Mean ±SD	Mean ±SD		
Pre-total pain score	8.15±1.54	8.73±1.50	1.24	>0.05
Follow up 1 (cold) total painscore	7±2.15	7.72±1.89	1.21	>0.05
Follow up 1 (warm) totalpain score	4.44±1.57	5.55±2.0	2.22	<0.05*
Follow up 1 (contrast) totalpain score	2.67±1.24	3.69±1.58	2.29	<0.01*

*Indicate significance differences.

Discussion

The fourth most significant disability's root cause worldwide is osteoarthritis, which is the third most common cause of illness burden. According to recent estimates by Lawrence et al. and Rabenda et al. (2019 and 2020), the prevalence of arthritis has grown by 750000 cases year since 1990.

According to the current study, the sample under examination had an average age of 54.21 9.37 years. The results of Tsauo et al. (2021) and Sarzi-Putini et al. (2022) agree with this finding They reported that after the ages of 50 for women

and 55 for males, osteoarthritis prevalence significantly increases. Age is a role in the development of osteoarthritis.

Knee osteoarthritis affects more women than men, according to Sarzi-puttini et al. in 2022, who also discussed sex. This is consistent with the current study's findings, which showed that the population under examination was made up of 75 percent women. Furthermore, housewives made up almost two-thirds of the sample for this study. Levensen et al. (2021), the risk of knee osteoarthritis increases with any job that requires repetitive motions and overuse of the muscles and joints that support those motions.

According to a study (Coggen et al., 2020), arthritic joint replacement risk increased dramatically as body mass index increased. According to the study's findings, the sample's mean BMI was 36.64 \pm 4.7 kg/m, which is consistent with this. Furthermore, the sample's BMI was reported by Shaban H. (2014) to be 36.75 \pm 5.16 kg/m.

The majority of the population examined in the current study had no familial susceptibility for osteoarthritis and therefore no family history of the disease. This is at odds with the findings of Robert and Lappe, 2019, who found that the prevalence of osteoarthritis was three times greater among sisters of osteoarthritis than in the general population. The limited sample size of the current study, which precludes studying prevalence, may be the explanation for this.

It was discovered that after subjects received education, improvements in all areas of the subjects' practice of the three therapy processes were statistically significant. With Zaghoul (2016) reporting that knowledge influences practice and that the studied sample had a statistically significant higher mean performance score post-program than pre-program, this result is inconsistent with that claim.

With knee osteoarthritis, there are specific symptoms such as knee pain and other symptoms like joint stiffness and knee swelling, as well as changes in daily activities, function, sports, and quality of life. The cardinal and dominant symptoms of osteoarthritis are joint pain that can be deep, aching, and localized. According to the current study's pre-total pain score and mean pre-total knee osteoarthritis outcome score, respectively (Cicuttini F and Grainger, 2018), mild knee symptoms were prevalent in the participants.

For the management of hip and knee OA, many researches had suggested that a combination of pharmaceutical and nonpharmacological treatment is widely used (Zhang et al., 2022). In the treatment of heat or cold therapy, a number of modalities have been researched (Hulme et al., 2017). In terms of the cold rub gel therapy, it was discovered that although patients still experienced moderate KOOS and severe pain, their overall KOOS and pain scores had decreased after the application of the cold therapy. According to (Brosseau et al.,

2019 and Zhang et al., 2022), uses of ice packs for three weeks are followed by a slight improvement in discomfort. Contrary to the findings of this investigation, Bleaky et al. (2016) noted that 20-minute cold applications can diminish the propagation of painful impulses by up to 29.4% and last for 30 minutes following removal. This could be accounted for by the fact that our patients did not favor using cold rub gel, which could have an impact on the outcome.

According to research on warm therapy, modest knee problems result from a decrease in the overall KOSS score. In this regard, Garge (2018) claimed that the application of heat results in vasodilatation, which boosts oxygen to tissues and lessens knee symptoms such as joint stiffness. Additionally, warm therapy reduced pain intensity to a mild score, according to the current study's findings. This is in line with the findings of Lofgren and Norrbrink (2018), who reported that patients getting warm therapy experienced less discomfort on average than they had before the treatment. The nerve pain threshold might have increased, which would explain this.

The whole KOOS score was demonstrated to be reduced to mild knee symptoms and the total pain score was shown to be reduced to a moderate score in relation to the effect of contrast therapy. By Bonhaman et al., 2021, this might be demonstrated. They concluded that, although the physiological basis of the treatment is not fully understood, there is a side effect of contrast therapy for symptoms of knee osteoarthritis, such as reduction of inflammation, decreased edema, pain, and stiffness. Dengar and others, 2022. It was proven that contrast therapy, as opposed to cold or warm therapy, produced the highest improvement in the overall KOOS and pain score. The results and hypotheses of the current investigation are supported by this discovery.

About the side effects of the different treatment modalities, it was concluded that redness was occurred in more than one-third of the studied sample after applying warm therapy. This result coincides with (Nadler et al., 2019) who summarized that warm modalities provide significant pain relief with low side effects.

Although gender is likely to play some sort of influence, Dengar et al., 2022 said that further research is needed to determine the reasons for

the impact of cold, heat, or contrast. This is consistent with the current study's conclusion, which showed that after using warm and contrast therapy, there was a significant difference in the total pain levels for men and women.

Conclusion

According to the results of the current study, each subject's response to the use of contrast therapy, warm treatment, and cold rub gel for knee osteoarthritis pain and joint function was unique. However, subjects who used contrast therapy reported significantly worse knee issues and pain relief. Contrast, warm, and cold rub gel applications are generally non-invasive and secure.

Recommendations

These suggestions can be made based on the findings of the current study:

1. The initial effort to handle individuals with osteoarthritis should include the use of superficial warm, cold rub gel, or contrast therapy.
2. The most effective form of treatment for easing knee discomfort and pain should be contrast therapy.
3. To allow for a wider generalization of the findings, future research must consider the replication of the study with a bigger sample. The patient's desire for the selection of therapy should also be considered since it may have an impact on the outcomes.

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