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# Effect of Cold Application Versus Contrast Hydrotherapy on Patients Knee Osteoarthritis Outcomes

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**Abstract:** Background: Osteoarthritis (OA) is the most prevalent and far common debilitating form of arthritis which can be defined as a degenerative condition affecting synovial joint. Physical agents can fight the painful process such as cold or contrast hydrotherapy Aim. Evaluate the effect of cold application versus contrast hydrotherapy on pain control, functional abilities and quality of life. Setting: The study was conducted at Assuit University Hospital in out patients' clinics. Subjects: 180 adult patients with knee osteoarthritis. Tools: were selected four tools Tool I: Bio-socio demographic characteristics Tool II: 0-10 Numeric pain rating scale. Tool III: health assessment questionnaire. Tool IV: WHOQOL-BREF Results: decreased mean of pain score between contrast group than cold group ( $3.5 \pm 2.1$  vs  $7.0 \pm 1.9$  respectively, improve mean HAQ disability index score intervention was  $17.9 \pm 6.3$  &  $12.7 \pm 5.9$  between cold and contrast hydrotherapy respectively and increasing mean between contrast group than cold group regarding all domain of quality of life. Conclusion: greater pain relief and functional improvements found when subjects used contrast therapy. Recommendation: Superficial contrast therapy should be included in the early effort to manage patients with osteoarthritis.

**Keywords:** Knee Osteoarthritis, Cold Application, Contrast Hydrotherapy

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## 1. Introduction

Osteoarthritis is a heterogeneous disease, involving complex and interacting mechanical, biological, biochemical, molecular, and enzymatic feedback loops with cartilage degeneration as the common, final event [1-2]. Despite this degeneration, OA is an active process and a network of mechanisms reacting to stress or injury on the joint [2-3]. All joint features are affected in OA [4]. Structural changes include cartilage fibrillation, degeneration of articular cartilage, thickening of subchondral bone, osteophyte formation, synovial inflammation, degeneration of ligaments and meniscus, hypertrophy of joint capsule, cellular and molecular changes in nerves, as well as changes to periarticular muscle, bursa, fat pads [1-3]. The loss of cartilage and modifications to bone and synovial membrane contribute to an unfavourable biomechanical environment which increases stress on the joint and furthers the

progression of cartilage degradation [5].

Osteoarthritis (OA) is a progressive disease characterized by degeneration of articular cartilage and alteration of joint tissues, resulting in pain, stiffness and disability [1]. It is seventh in disease load studies conducted in Turkey and constitutes 2.9% of the total disease load [6]. Knees are the most commonly affected joints in osteoarthritis at a reported rate of 76% [7]. The knees, hips and hands are most commonly affected, with knee OA having the greatest impact on disability.

In Egypt, more than five million people have OA [8]. Approximately 85% of individuals over the age of 75 years of age experience some symptoms of osteoarthritis. 40% of individuals with the disorder experience significant difficulties with daily activities to the point of interfering with work-related or social roles. According to Hawamdeh and Al-Ajlouni [9] mentioned that among Arab patients in the late 30s and early 40s with a different clinical pattern and

a greater severity in comparison to Western world patients.

This complicates research trying to evaluate the efficacy of different therapies. Current analgesic treatments are not effective and the overall lack of successful treatment options remains a large and critical gap in the management of OA. Many of the limitations in discovering effective treatments for OA stem from an incomplete understanding of OA etiology, a poor ability to measure and define the disease or assess disease progression, and response to new treatment options [10].

Management of osteoarthritis requires multidisciplinary approach that includes, but not limited to pharmacotherapy, psychology, physical therapy, occupational therapy and surgery. The goals of treatment of patients with osteoarthritis are to reduce pain and other symptoms and to improve functional capacity. The American College of Rheumatology has recently published recommendations for pharmacological and non-pharmacological therapies in osteoarthritis of the hand, hip, and knee [11].

The main goal of any therapy for patients with knee OA in most cases is to reduce pain and improve the physical functioning. The summary [12] although pharmacological treatment is not proven to have outcomes that are of crucial importance and despite its controversy, medications are often recommended by doctors [13]. Medicines that are primarily used by patients with knee OA, with or without comorbidities [12].

Non pharmacologic methods such as physical therapy, exercise, weight loss, hot and cold applications, walking aids, shoes and insoles, transcutaneous electrical nerve stimulation and acupuncture are reported to be used in guides and brochures containing the most recent treatment recommendations. Specialists agree that the most effective treatment approach in knee osteoarthritis is the use of pharmacologic and non-pharmacologic methods together [14]. Non pharmacologic treatment methods ensure that individuals have an active role in coping with the pain and maintain some degree of the control over the disease. The combination of patient education and self-management intervention was found to improve both pain and function.

Nurses can help decrease symptoms by implementing non-pharmacological methods and ensuring that patients learn the procedures they can use by themselves [15- 16]. The nurse should then evaluate whether these methods provide the desired results. Local hot and cold applications are used to decrease the symptoms in knee osteoarthritis [7- 14]. It is reported that hot applications can be implemented for decreasing the pain the individuals feel and to provide flexibility, while cold applications can be used to decrease edema and pain.

Superficial hot treatment is believed to increase the pain threshold, reduce muscle spasm and relieve pain by acting on free nerve endings. In conjunction with this, superficial cold treatment is believed to decrease the pain and inflammation by constricting blood flow in superficial and intra-articular tissues and slowing nerve conduction. Superficial local hot and cold applications are recommended as simple and

reliable methods in the elimination of pain in many osteoarthritis treatment guides [14-17].

Contrast water therapy (CWT) uses both heat and cold to treat pain. A review of studies has suggested that, CWT is better at reducing muscle pain after exercise compared with doing nothing or resting [18]. The effects of local heat are well reported, alternating application of hot and cold is known to produce marked stimulation of local circulation. It has been shown that a 30 minute contrast bath produces a 95% increase in local blood flow when the lower extremities alone are immersed. When all four extremities are immersed at the same time, there is a 100% increase in blood flow in the upper extremities and a 70% increase in the lower extremities [19].

### *Significance of the Study*

Osteoarthritis is the most common disease affecting 5.596869 from the total population in Egypt. Osteoarthritis of knees is a common and progressive condition. It is reported that, 6% of adults suffer from clinically significant knee osteoarthritis with the prevalence increasing with each decade of life [20]. It has been observed that there was about 600 patients visited orthopedic outpatient clinics, orthopedic department and physiotherapy with knee osteoarthritis at Assuit university hospital according to Assuit hospital statistical records complaining from joint pain, swelling and unable to perform activities of daily living cold or contrast hydrotherapy may help in relieving patients' pain, It also provide patients with easily functional abilities. Hence this study may be performed to provide evidence for nursing practice.

### *Aim of the Study*

Evaluate the effect of cold application versus contrast hydrotherapy on pain control, functional abilities and quality of life for patients' knee osteoarthritis outcomes.

### *Research Hypothesis*

Patients exposed to cold application exhibit pain control and quality of life than patients exposed to contrast hydrotherapy.

Patients exposed to contrast hydrotherapy exhibit pain control and quality of life than patients exposed to cold application.

### *Operational Definition*

Contrast hydro therapy: it is the application of heating pads, cold packs, or soaked towels three to six alternations between heating and cooling, heating pads for 1-5 minutes & Cold application for 20 minutes twice daily.

## **2 Subjects and Methods**

### **2.1. Research Design**

Quasi- experimental research design was utilized to conduct data of this study.

### *Setting:*

The study was conduct at Assuit University Hospital in out patients' orthopedic clinics.

*Subjects:*

One hundred and eighty patients were selected and assigned randomly and alternatively into 2 equal groups: group 1: were exposed to cold application for 20 minutes / twice daily, group 2: were exposed to contrast hydrotherapy heating pads for 1-5 minutes & Cold application for 20 minutes twice daily. Both groups were matched in relation to age, sex, and stage of osteoarthritis.

## Inclusion criteria:

- a) Adult patients
- b) Mild or moderate degree of osteoarthritis.
- c) No history of previous knee arthroplasty
- d) No orthopedic surgical procedure on the affected knee,
- e) free from any other associated diseases such as diabetes mellitus or cardiac diseases,
- f) Not on pain control medications,
- g) Not on any kind of metal implants and/ or pacemaker
- h) No history of receiving corticosteroid injection to the knee within the past 6 months.

## Tools of study

Three tools were used in this study for data collection:

## Tool I: Bio-socio demographic characteristics:

It was developed by the researcher to collect data about personal & medical data. It included the following two parts:

Part (1): Personal data as: age, sex, marital status, level of education, and residence.

Part (2): Medical data as body mass index, family history of osteoarthritis, stages and duration of osteoarthritis.

Tool II: Numeric Pain Rating Scale: It was developed by [21] to assess pain intensity.

Scoring system: The scale consists of 10 cm line that was numerated from zero to ten in which:

0 = no pain,

1-3 = mild pain (little interfering with activities of daily living),

4-6 = moderate pain (interfering significantly with activities of daily living),

7-10 = sever pain (disabling, unable to perform activities of daily living).

Tool III: WHOQOL-BREF, (1997) [22]: This tool was developed by WHO to assess quality of life. It consist of 26 items of satisfaction that were divided into five domains: Domain 1: quality of life (2 items); Domain 2: Physical health (7 items); Domain 3: Psychological health (6 items); Domain 4: Social relationships (3 items); and Domain 5: environmental health (8 items).

Scoring system: Each individual item of the WHOQOL-BREF is scored from 1 to 5 on a response scale, which is stipulated as a five point ordinal scale. The scores are then transformed linearly to a 0–100-scale. These two questions include five point response categories for QOL: “very poor”, “poor”, “neither poor nor good”, “good” and “very good” and for Satisfaction with Health: “very dissatisfied”, “dissatisfied”, “neither satisfied nor dissatisfied”, “satisfied” and “very satisfied”. Analysis was performed after collapsing the bottom two categories (i.e., for QOL “very poor” and “poor”; for Satisfaction with Health “very dissatisfied” and

“dissatisfied”) and comparing them to the top three. This approach produced the following derived variables: “poor QOL” vs. “good QOL” and “dissatisfied with own health” vs. “satisfied with own health”. Therefore, unlike the 4 domains, these two questions are treated as binary outcomes.

*Validity and Reliability*

The tools of the study were given to a group of five experts in the Medical Surgical Nursing at faculty of Nursing was elicited regarding the format, layout, consistency, accuracy, and relevancy of the tools. Reliability of the tools (tool II and tool III) were performed to confirm validity of tool and calculated statistically. The internal consistency measured to identify the extent to which the items of the tool measure the same concept and correlate with each other by Cronbach’s alpha test were .871 & 0.921 respectively.

**2.2. Methods**

A written approval letter from the faculty of nursing at the University of Assuit and was submitted to the responsible authorities of the previously mention setting to get permission for data collection. A written informed consent was obtained from each patient after explaining the purpose of the study.

*Pilot study*

A pilot study was carried out after the development of the tools and before starting the actual data collection, on 4 subjects (5% of the total sample). The aim of the pilot study was to test the feasibility of the study and the sequence of items. It also served to estimate the time required for filling the questionnaire sheets and applied the intervention which was about 30 - 40 minutes. They were excluded from the total number of the study subjects. The process of pilot study took one week (from 18/2 to 25/2) in August 2017.

## Data collection procedure:

Data was collected from March 2017 to December 2017. The data collection was done through the following phases:

## A. Preparatory phase (Assessment phase):

The researcher interviewing the patients with knee osteoarthritis in the out orthopedic out patients’ clinics to explain purpose and nature of the study and to get their oral consent to participate in the study. Categorization of the patients into two groups (cold group & contrast group) 90 patients for each group. The baseline data was collected from both groups.

## B. Implementation phase:

*For cold group*

Patients were interviewed individually by the researcher in orthopedic out patients clinics and explained all items of application, then applied cold application for 20 minutes by wrapping cold pads over the affected OA knee two times/day (in the morning and afternoon) under the researcher observation for 3 observation to ensure the patients’ applied the procedure by the correct way and after that asked the patients his telephone number to follow up them for one month.

*For contrast hydrotherapy group*

Patients were interviewed individually by the researcher in orthopedic out patients clinics and explained all items of application, then applied contrast hydrotherapy application by alteration between heating and cooling water by wrapping heated pads for 1- 2 min then cold pads for 20 minutes over the affected OA knee two times/day (in the morning and afternoon) under the researcher observation for 3 observation to ensure the patients' applied the procedure by the correct way and after that asked the patients his telephone number to follow up them for one month.

*Evaluation phase:*

Each group was evaluated after one month of application in the outpatient clinics by using data collection tools (Tool II and Tool III).

*Ethical consideration:*

The researcher was explained to patients the aim of the research study. Patients were advised about their rights to withdraw from the study at any points. Patients consent was obtained and Patients respect, privacy and information confidentiality was protected using a numbered coded on all questionnaire.

*Statistical Design:*

Statistical analysis was done by using Statistical Package for the Social Science (SPSS 20.0). Quality control was done at the stages of coding and data entry. Data were presented by using descriptive statistics in the form of frequencies and percentage for qualitative variables. Chi square was used to test the association between two qualitative variables or to detect differences between two or more proportions and the sample size large. Fisher's exact test used to test the association between two qualitative variables or to detect differences between two or more proportions and the sample size is small. Inferential statistical tests of significance such as independent t-test were used to identify group differences and the relations among the study variables and statistical significance was considered at  $p \leq 0.05$ .

### 3. Results

**Table 1.** Percentage distribution of patients socio-demographic characteristics between both cold and contrast groups pre intervention (n= 180).

Socio- demographic characteristics	Cold (n = 90)		Contrast (n = 90)		X <sup>2</sup>	P- value
	No.	%	No.	%		
<b>Age (years)</b>						
20 – 30	13	14.4	12	13.3		
31- 40	11	12.2	24	26.7	6.069	07NS
41- 65	66	73.3	54	60.0		
Mean ± SD						
<b>Gender</b>						
Male	39	43.3	41	45.6	1.090	764NS
Female	51	56.7	49	54.4		
<b>Marital status</b>						
Single	11	12.2	11	12.2		
Married	68	75.6	74	82.2	2.504	286NS
Widow	11	12.2	5	5.6		
<b>Residence</b>						
Rural	63	70.0	61	67.8	104	747NS

Socio- demographic characteristics	Cold (n = 90)		Contrast (n = 90)		X <sup>2</sup>	P- value
	No.	%	No.	%		
<b>Age (years)</b>						
Urban	27	30.0	29	32.2		
<b>Education level</b>						
Illiterate	54	60.0	53	58.9		
Read and write	11	12.2	13	14.4		
Preparatory education	2	2.2	0	.0	2.210	697NS
Secondary education	14	15.6	15	16.7		
University	9	10.0	9	10.0		

Fisher' exact test, Pearson chi- square test, Significance level p at 0.05.

This table showed 73.3% vs 60% of studied sample their age was ranged between 41- 65 years, 56.7% vs 54.4 % was female, 75.6% vs 82.2% married, 70% vs 67.8% lives in rural areas, moreover 60% vs 58.9% was illiterate among both contrast and cold groups respectively with no statistical significance differences.

**Table 2.** Percentage distribution of patients of both groups cold and contrast hydrotherapy with relation to medical data (n= 180).

Medical data	Cold group (n = 90)		Contrast group (n = 90)		X <sup>2</sup>	P- value
	No.	%	No.	%		
<b>Family history for osteoarthritis</b>						
Yes	68	75.6	67	74.4		
No	22	24.4	23	25.6	030	863NS
<b>Duration (Years)</b>						
1-5	73	81.1	69	76.7		
5- 10	16	17.8	16	17.8	Fisher	
10- 15	1	1.1	3	3.3	3.113	375NS
15- 20	0	.0	2	2.2		
Mean ± SD	3.9 ± 2.5		4.3 ± 4.6			
<b>Stages of osteoarthritis</b>						
Stage 1	0	.0	5	5.6		
Stage 2	24	26.7	13	14.4	Fisher	
Stage 3	39	43.3	41	45.6	8.596	07NS
Stage 4	27	30.0	31	34.4		
<b>Body Mass Index (BMI)</b>						
Normal weight	7	7.8	10	11.1		
Over weight	30	33.3	23	25.6	1.599	449NS
Obese	53	58.9	57	63.3		

Fisher' exact test, Pearson chi- square test, Significance level p at 0.05.

This table presented that three quarters (75.6% vs 74.4%) of studied sample have previous family history for osteoarthritis, the majority and just above three quarters (81.1% vs 76.7 %) of them disease duration was less than five years ago, two fifth (43.3% vs 45.6 %) suffered from stage three of osteoarthritis, and more than half was obese respectively among both cold and contrast hydrotherapy group with no statistical significance differences.

**Table 3.** Difference in pain level between patients of both cold and contrast hydrotherapy application pre/ post intervention (n= 180).

Pain rating scale	Cold group (n = 90)				Contrast group (n = 90)			
	Pre		Post		Pre		Post	
	No.	%	No.	%	No.	%	No.	%
No pain	0	.0	0	.0	0	.0	19	21.1
Mild pain	0	.0	0	.0	0	.0	6	6.7
Moderate pain	22	24.4	29	32.2	5	5.6	61	67.8
Severe pain	11	12.2	16	17.8	18	20.0	2	2.2
Very severe pain	32	35.6	40	44.4	38	42.2	2	2.2
Worst pain	25	27.8	5	5.6	29	32.2	0	.0
Mean ± SD	7.9 ± 2.0		7.0 ± 1.9		8.1 ± 1.6		3.5 ± 2.1	
Fisher exact (P - value)	16.755 (.001**)				172.019 (.0002**)			

Fisher' exact test, Pearson chi- square test, Significance level p at 0.05.

This table indicated that 27.8% of patients was suffering from worst pain pre applying cold intervention compared to 5.6% of them one month's post the intervention, while in the contrast hydrotherapy group 35.2% of them was suffering from worst pain pre applying the intervention compared to no one post intervention with highly statistically significance differences p – value.001&.0002 respectively.

**Table 4.** Comparison between mean and standard deviation of subdomain of quality of life between cold and contrast hydrotherapy groups patients one month's post the intervention (n= 180).

Domain	Cold	Contrast	T- Test	P - value
	Mean ± SD	Mean ± SD		
Overall QOL & General Health	7.1 ± 1.3	7.2 ± 1.1	1.141	.255 NS
Physical domain	19.7 ± 2.9	21.3 ± 5.1	2.512	.013*
Psychological domain	19.7 ± 2.9	20.3 ± 2.8	2.819	.005*
Social domain	11.1 ± 1.2	11.7 ± .8	4.669	.0001*
Environmental domain	22.4 ± 3.9	22.9 ± 3.1	.885	.378 NS
Total Qol	80.7 ± 6.9	84.1 ± 10.1	2.570	.05*

Independent t test, Significance level p at 0.05.

It is clear from this table is increasing mean scores among contrast hydrotherapy group than cold group one month's post the intervention regarding all domain of quality of life with statistically significance differences in physical, psychological, social domains and total quality of life where P – value. 013, .005, .0001&.05 respectively.

**Table 5.** Mean and standard deviation of total Quality of life of cold and contrast hydrotherapy groups one month's post intervention in relation to socio-demographic characteristics (n= 180).

Socio- demographic characteristics	Cold (n = 90)	Contrast (n = 90)	T / F	P – value
<b>Age (years)</b>				
18- 30	83.2 ± 5.8	87.0 ± 7.0		
31- 40	79.5 ± 4.7	84.3 ± 8.8	4.165	.02*
41- 65	80.4 ± 7.3	79.8 ± 10.6		
Test of significance	1.062 (.350) 3.656 (.03*)			
<b>Gender</b>				
Male	81.6 ± 6.1	85.0 ± 7.9		
Female	79.9 ± 7.4	79.4 ± 10.9	2.899	.004**
Test of significance	1.174 (.282) 2.994 (.087)			

Socio- demographic characteristics	Cold (n = 90)	Contrast (n = 90)	T / F	P – value
<b>Age (years)</b>				
<b>Marital status</b>				
Single	85.7 ± 7.3	83.7 ± 7.1		.139
Married	80.1 ± 6.7	81.5 ± 10.5	1.996	
Widow	78.9 ± 6.1	84.6 ± 8.4		NS
Test of significance	3.762 (.03*) .410 (.665)			
<b>Residence</b>				
Rural	80.1 ± 6.9	81.0 ± 9.3		.074
Urban	82.0 ± 6.6	84.0 ± 11.5	1.711	NS
Test of significance	1.541 (.218) 2.132 (.148)			
<b>Education level</b>				
Illiterate	76.5 ± 4.9	78.7 ± 10.5		
Read and write	79.9 ± 6.5	81.5 ± 10.6		
Middle education	80.1 ± 7.8	.....		.121
Secondary education	81.4 ± 4.3	83.9 ± 7.5	1.853	NS
University	85.8 ± 10.0	85.4 ± 8.6		
Test of significance	1.697 (.158) 1.207 (.312)			

Independent t test, Significance level P at 0.05.

This table presented that were existed differences between cold and contrast groups regarding of total quality of life with their age and gender which p – value.02&.004 respectively.

### 4. Discussion

Osteoarthritis (OA), particularly at the knee, is a leading cause of disability in older adults characterized by progressive articular cartilage loss resulting in joint pain and disability [23]. Some risk factors contribute to the appearance of the disease, such as sex, age, trauma, overuse, and genetic conditions. With disease progression, patients' complaints of physical limitations, pain, and functionality restriction increase, leading to an important decrease in their quality of life [24].

Regarding the patient age in the current study found that osteoarthritis increase with age. These findings are similar to that which reported in the literature [25] along with the increase in age, there is an exponential increase in the associated risk factor of obesity, due to progressive sedentary behavior, changes in lifestyle patterns, diet routine, and work environment conditions among the adult population. Radiographic damage in a knee also increases with age, even in the absence of disease, demonstrating that mild joint degradation may occur and accumulate with aging.

Regarding patient' sex the result of the present study found that women have increased risk than men of developing knee osteoarthritis. This agree with [16- 26- 27- 28] because a withdrawal from estrogen at menopause may be a trigger, hormonal changes and osteoporosis, which may accelerate degenerative changes in multiple joints, changes in muscle strength, the presence of less muscle mass and more fat mass, load on joints, pelvic structure, knee morphology, neuromuscular strength, hormonal changes occurring with age, and changes in the balance between bone formation and bone reabsorption.

In a recent study in Egypt by Abd Elstaar et al. [29] assessed the quality of life (QoL) in patients with primary knee osteoarthritis (KOA) which involved 116 patients

admitted to the outpatient clinic of rheumatology and orthopedics in Menoufia University Hospital reported that 74.1% of these patients were women and 25.9% were men.

Concerning to residence of patients with knee osteoarthritis the current result showed that more than two third of them comes from rural area. This result consistent with Haq and Davatchi, [30] examined the prevalence of knee OA and knee pain, sex ratio, urban/rural differences and other risk factors in Community Oriented Program for Control of Rheumatic Disorders (COPCORD) publications, mentioned that after adjusting for age and sex distribution the prevalence was higher in rural communities. Also, Jørgensen *et al.* [31] found living in a rural setting was related to OA. Also, A Systematic Review and Meta-Analysis done by Usenbo *et al.* [32] mentioned that highest prevalence of 33.1% for knee osteoarthritis in rural South Africa. It is possible that participants who live in rural areas may engage in harder labor *e.g.*, agriculture, which may increase disease risk.

Contradicted to this result [33] reviewed the prevalence of hip and knee OA from population-based studies conducted in the Asian region reported in China, patients from a rural community demonstrated approximately double the prevalence of symptomatic knee OA when compared with their urban counterparts.

In relation to educational level, more than half of the cold group & contrast group was illiterate which agree with Jhun *et al.* [34-35] on the other side patients with higher education had better functional capacity when compared to elementary school-educated patients. Current concluded that functional limitation was also dependent on the level of education.

Regarding Body Mass Index (BMI) in the current result illustrated that more than half was obese patient for both cold and contrast hydrotherapy group which agree with Elbaz *et al.* [36-37] they added obesity can result in excessive mechanical demand and increased loading and forces on the knee joint, which can directly damage articular cartilage also, Haq and Davatch, [30] illustrated that obesity, female sex, and advanced age were significantly associated with an increased risk of knee OA which agree with this study. In addition in a recent study in Egypt done by Ramadan *et al.* [38] evaluated the impact of physical exercise on the activities of daily living in women with early OA recruited from the outpatient clinic of El-Demerdash University Hospital, presented that more than half of studied patients was obese.

Regarding to pain this result indicated that more than one quarters of patients was suffering from worst pain pre applying cold intervention compared to the minority of them one month's post the intervention, while in the contrast hydrotherapy group more than one third of them was suffering from worst pain pre applying the intervention compared to no one post intervention with highly statistically significance differences. This result consistent with Corbacho & Dapuetto [39] assessed preferences for, and effects of, 5 days of twice daily superficial heat, cold, or contrast therapy applied with a commercially available system

permitting the circulation of water through a wrap-around garment, use of an electric heating pad, or rest for patients with level II–IV osteoarthritis (OA) of the knee in USA confirmed that contrast therapy provided the greatest improvement in pain scores than cold therapy and supported by daCosta DiBonaventura *et al.* [40] evaluated the impact of self-rated OA severity on quality of life, healthcare resource utilization, productivity and costs in an employed population relative to employed individuals without OA US National Health and Wellness Survey reported that adults with OA report more pain and This finding supports the results and hypothesis of the present study.

Moreover, study done in Egypt [41] compared the effect of cold, warm and contrast therapy on controlling knee osteoarthritis associated problems carried out in orthopedic outpatient clinics of Menoufia University and teaching Hospitals, concluded that all of the three methods (cold, warm and contrast therapy) of therapy resulted in improvement pain but the most appropriate protocol of treatment to relive pain was contrast therapy.

In a recent study done in India [42] investigated the effect of a hydrotherapy based alternate compress on osteoarthritis of the knee joint, presented that significant results in pre and post cold group and in hydrotherapy group regarding reducing pain sensation.

Regarding mean score of quality of life and subdomains the current results found that increasing mean scores among contrast hydrotherapy group than cold group one month's post the intervention regarding all domain of quality of life with statistically significance differences in physical, psychological, social domains and total quality of life.

This is similar to Walker & Littlejohn [43] reported that patients with osteoarthritis disease score poorly for all subscales on the quality of life outcomes survey and Denegar *et al.* [17] mentioned that contrast treatment provided the greatest improvement in two of the four KOOS subscales, and was far superior for improving subjects' pain rating via a visual pain scale.

This finding was in agreement with Murray *et al.* [44-45] reported that life quality and mental health, there were significantly higher rates of mental stress in the disease group. Considering that quality of life and mental status are significantly affected by OA. This mean that patients with knee osteoarthritis suffering from high pain levels and decreased functional abilities is not surprisingly also experiencing poor health – related quality of life.

The result is consistent with daCosta DiBonaventura *et al.* [40] reported that adults with OA report worse quality of life, greater number of hospitalizations and reduced productivity than those without also, Wright *et al.* [46], demonstrated widespread cold, heat, and pressure hyperalgesia. OA participants with widespread cold hyperalgesia were compared with the remaining OA cohort to determine whether they could be distinguished in terms of hyperalgesia, pain report, pain quality, and physical function who attended the laboratory at Royal Perth Hospital in Australia mentioned that participants with knee OA exhibited reduced scores on

the physical health subscale of the SF-36 ( $P=0.01$ )

Recent study done [47] evaluated health-related quality of life (HRQoL) in primary knee osteoarthritis (KOA) patients using the osteoarthritis knee hip quality of life (OAKHQoL) questionnaire recruited from the Rheumatology and Rehabilitation outpatient clinic, Cairo University concluded that Egyptian patients with primary KOA have relatively poor HRQoL.

In addition, Wright et al [42] found that there were significant results in pre and post cold group and in hydrotherapy group about improving quality of life in the studied patients.

## 5. Conclusion

Based on the findings of the current study the following conclusions can be drawn: decreased mean of pain among contrast hydrotherapy group than cold group with highly statistically significance differences. Also, there were increasing in mean scores among contrast hydrotherapy group than cold group one month's post the intervention regarding all domain of quality of life with statistically significance differences in physical, psychological, social domains and total quality of life.

## 6. Recommendations

- 1) Superficial cold or contrast therapy should be included in the early effort to manage patients with knee osteoarthritis.
- 2) Contrast therapy should be considered the most effective treatment options for relieving knee symptoms and pain.
- 3) Patients with symptomatic OA of the knee, who are overweight should be encouraged to lose weight (a minimum of five percent (5%) of body weight) and maintain their weight at a lower level.
- 4) Replication of the study with larger sample must be considered to allow greater generalization of the results.

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