- *Basic Research*

Effect of Hot Mud Application versus Revulsive Compresses on Controlling Knee Osteoarthritis Associated Pain

Manar Fathy Hamza [1], Mayada Taha Sabaa[2], Eglal Hassanein Abdel Hakeim[3]

[1] Assistant professor, Medical Surgical Nursing, Faculty of Nursing, Helwan University, Egypt,
[2] Assistant professor, Community Health Nursing, Faculty of Nursing, Helwan University, Egypt,
[3] Assistant professor, Adult Health Nursing, Faculty of Nursing, King Salman International University, Egypt

Corresponding author: Dr. Eglal Hassanein Abdel Hakeim

Abstract

Background: Hot Mud application and Revulsive compresses are broadly used in the treatment of KOA diseases for pain relief. **Aim of the study:** to compare the effect of hot mud application versus revulsive compress on controlling knee Osteoarthritis associated pain **Design and setting:** A quasi-experimental design was utilized. The study was conducted at orthopedic, and Rheumatology Outpatient Clinics at Al Kaser Al Ani hospitals affiliated to Cairo University in Egypt. **Subjects:** A purposive subject composed of 100 adult patients (of both genders) with knee osteoarthritis equally divided into two groups (n=50). Group one received direct hot mud application, while group two received revulsive compresses. **Tools of data collection:** Four tools were utilized to collect data **I:** Structured interview questionnaire. This tool consists of two parts: **Part 1:** Patient's socio demographic characteristics, **Part 2:** Patient's medical history **II**: The Western Ontario and McMaster Universities Arthritis Index (WOMAC). **III**: Pain disability index. **IV:** Visual analogue scale. **Results:** There was a highly statistically significant difference after application of hot mud application (P>0.000) in improving symptoms and reducing pain severity better than revulsive compresses on controlling knee osteoarthritis associated pain. **Conclusion**: Implementation of hot mud application exabit better effect than revulsive compresses in improving symptoms and reducing pain severity among patients with knee osteoarthritis. **Recommendation:** alternative therapy should be applied to reduce pain and improve the associated symptoms as hot mud application& revulsive compresses.

Key words:

Knee Osteoarthritis, hot mud application, revulsive compresses, pain

1.Introduction:

Knee osteoarthritis (KOA), approved as musculoskeletal diseases with degradation of the articular cartilage and tightening of the joint space, is a public in middle-aged and elderly people aged over 50 years. Knee osteoarthritis (KOA) is considered a prevalent chronic joint disorder described by the gradual change of articular cartilage, resulting in pain, stiffness, and reduced function. The global burden of KOA is substantial, necessitating comprehensive strategies to address its associated symptoms and improve the quality of life for affected individuals **(Hassan, et al. 2024 &El Saleh, et al.2023).**

Knee osteoarthritis (KOA) is the most common form of osteoarthritis and a commonly prevalent joint disease globally. In the USA, OA influences closely 40 million women and men which almost affect 15% of the whole population and will rise to 18.2% by 2020. It is expected that by 2030 there will be 67 million people detected with OA in the United States. KOA is emphasized as the most common form of OA. A predictable 10% to 13% of old people aged ≥60 years have nearly degree of OA, with the disease being more common in women than in men **(Fawole, et.al.,2024&**

Srour, and Saad 2022).

Knee osteoarthritis (KOA) is a public progressive multifactorial joint disease and is described by chronic pain and functional infirmity. It considered almost four to fifths of the problem of OA in the world and increases with overweightness and age. Till this moment, KOA is incurable except knee arthroplasty which is considered as an actual treatment for progressive stage of the disease, however, which is responsible for extensive health budgets **(Brown, et al. 2023 and Han& Cui, 2020).**

The core goal of KOA treatment is to diminish the pain, promote the joint function and to improve the Quality of life (QoL). The nonpharmacological treatment modalities like hot mud application and revulsive compresses treatments are extensively recommended as the first line therapy of OA **(Dinesh, et al.,2019).**

Hot mud therapy involves the application of warm mud packs to the affected knee, aiming to enhance blood circulation, reduce inflammation, and alleviate pain. On the other hand, revulsive compresses are an alternative application of hot (98-104 F) /(36-40C) immediately followed by cold (55- 65 F)/(12-18C) application which promote blood circulation, comfort inflammation, diminish edema, and strengthen the connective tissue. Both mud therapy and revulsive compress is a management of choice in the treatment of kOA in naturopathy **(Shetty, et al, 2018 &Hou, et al.2020).**

Recent researches emphasized the efficiency of hot mud therapy and revulsive compresses in the treatment and secondary prevention of KOA by decreasing the pain and functional limitation of OA affected people. Nurses play an important role to minimizing symptoms of KOA by applying non-pharmacological approaches and confirming that patients learn the procedure, they can apply by themselves, as well the nurse should evaluate the effect of these approach to deliver the desired results **(Smith, et al. 2021& Wagner,2024).**

Significance of the study:

Knees are the greatest affected joints in OA, and it was described that radiographic progression has been noticed even with early KOA involvement in Egyptian people carrying a substantial and increasing public health problem. The most widespread kind of aging-related pain is Osteoarthritis (OA), which marks 88% of adults aged 45 or older and affects 43% of patients who are 65 or older **(Hassan, et al.2023).** Knee osteoarthritis (KOA) is the most widespread

arthropathies affecting up to 251 million people in the world. In Egypt, a recent epidemiologic study stated that KOA prevalence was 29.2 per 1000 (**Weheida, Abdel-Naby & Abd alwahab, 2019).** Knee osteoarthritis (KOA) is one of the leading causes of worldwide disability that could limit the patient's ability to achieve daily activities and to perform in work. Globally, KOA is the eighth leading cause of disability than associated with other joint (**Mahmoud et al., 2019& Shetty, et al,2018).**

This study seeks to investigate and compare the effectiveness of hot mud application and revulsive compress in controlling knee osteoarthritis-associated pain.

Operational definition:

Revulsive compress is an application of very hot (36-40° C) and very cold compresses (12-18° C) in alternative (one following the other), which promote blood circulation, facilitate inflammation, decrease edema, and strengthen the connective tissue (**Basuny, et al., 2020).**

Aim of the study

This study aimed to compare the effect of hot mud application versus revulsive compresses on controlling knee osteoarthritis associated pain.

Research hypothesis:

The following research hypotheses will formulate to realize the aim of this study:

H1: Application of hot mud application will improve the associated symptoms of patients with knee osteoarthritis.

H2: Application of hot mud application will reduce the pain severity of patients with knee osteoarthritis.

 H3: Application of revulsive compresses will improve the associated symptoms of patients with knee osteoarthritis.

H4: Application of revulsive compresses will reduce the pain severity of patients with knee osteoarthritis.

H5: The hot mud application has an effect better than revulsive compresses in reducing the pain severity and associated symptoms among patients with knee osteoarthritis

II. Materials & Methods:
Research design:
        A quasi-experimental design was utilized to accomplish this study's purpose. Two Group one received direct hot mud application, while group two received revulsive compresses.

Settings:

The study was conducted at orthopedic and Rheumatology Outpatient Clinics at Al Kaser Al Ani hospitals affiliated to Cairo University in Egypt.

Subjects:

A purposive subject consisted of 100 adult patients with KOA in the selected setting, who accepts to participate in the study. The subject size calculation was done by subject size calculator program with confidence level at 95 %, d=error proportion (0.05) and p= probability (50%) =0.50. (With total population 140 in previous six months at the same sitting, have the

mentioned inclusion criteria). The selected patients divided into two groups randomly (assignee one patient to group one and the second patient to group two), first group (**Hot Mud application group=50 patients**) and the second group (**Revulsive compresses group=50 patients).**

Inclusion criteria

The patients will select regarding the following criteria:

· Free from reduced sensation to neurovascular compromise/peripheral neuropathy.

· No history of previous knee arthroplasty or any other orthopedic surgical procedure.

· There is no history of receiving corticosteroid injection

Tools of data collection

Four tools were used to collect the data including

Tool I: A Structured Interview Questionnaire

It was design by the researchers in simple Arabic language after meticulous revising of the related current literature (**Basuny, & et al., 2020 & Archnah, & et al., 2018**) and it was composed of two parts:
Part 1: Demographic Characteristics: This part involved data about the patient's age, sex, level of education, marital status, occupation, and family income and place of residence

Part (2): Patients' Medical History: This part assess the medical history of the patients and it consisted of six questions including co-morbidity, duration of the disease, family history according to knee osteoarthritis and body mass index (BMI) to determine the degree of obesity by using the following equations according to guidelines from (**Weir & Arif, 2021).**

BMI = (weight in kilograms) / (height in meter) 2: It was separated into four levels: underweight (BMI < 18.5), normal BMI ($\geq$ 18.5- 24.0), overweight (25.0 - 29.0) and obese (BMI $\geq$ 30 - 40) Morbid obese (> 40)

Tool II: The Western Ontario and McMaster Universities Arthritis Index (WOMAC)

It's adopted from (**Bellamy, & et al., 1998, & Guermazi, & et al., 2004) to measure pain, stiffness and physical function of the joint**. It is a self-administered questionnaire involving 24 items divided into 3 subscales:

- Pain (5 items): during walking, using stairs, in bed, sitting or lying, and standing upright
- Stiffness (2 items): after first waking and later in the day
- Physical Function (17 items): using stairs, rising from sitting, standing, bending, walking, getting in / out of a car, shopping, putting on / taking off socks, rising from bed, lying in bed, getting in / out of bath, sitting, getting on / off toilet, heavy domestic duties, light domestic duties

Each item of questionnaire offered five responses- "none" scored as 0, "mild" as 1, "moderate" as 2, "severe" as 3 and "extreme as 4.

Scoring system

The total score for each domain was: pain- (0–20; 5 items each scored 0–4), stiffness (2 items, 0–8), and physical function (17 items, 0–68). Higher scores indicated worse pain, stiffness, or physical function. The total score for each domain was the sum of scores for each response to each item in the questionnaire.

Tool III: Pain Disability Index (PDI)

It was adopted from **Chibnall & Tait (1994);** it is a self-report instrument for measuring the degree of interfering of pain on the capability of a patient to share in essential life activities. It contained (7) groupings of life activity including family/home responsibilities, recreation, social activity, occupation, sexual behavior, self-care and life-support activities

Scoring system

This scale designated the level of infirmity that patients typically experience ranged from 0 to 10. A score of 0 means no disability at all and a score of 10 signified that all of the activities in which the patient would normally be involved have been totally disrupted or prevented by pain. Total pain disability index included SUM (points for all 7 categories), in which (0) minimal index and (70) maximal index. The higher the index, the greater the patient's disability due to pain.

Tool IV: The Visual Analogue Scale (VAS)

This tool was adopted from **(Price. & et al., 1983)** to assess the pain severity and intensity pre and post intervention for patients with KOA. The pain VAS is a single-item scale. The pain VAS is self-completed by the patient. The patient is asked to place a line perpendicular to the VAS line at the point that represents their pain intensity.

Scoring system:
Using a ruler, the score is calculated by measuring the distance (mm) on the 10-cm line between the "no pain" anchor and the patient's mark, providing a range of scores from 0–100.
Score interpretation.
A higher score shows greater pain intensity. Based on the distribution of pain VAS scores in postsurgical patients World Health Organization delineate their surgical pain intensity as none, mild, moderate, or severe, the following cut points on the pain VAS have been recommended: no pain (0–4 mm), mild pain (5–44 mm), moderate pain (45–74 mm), and severe pain (75– 100 mm).

Content Validity:

A panel of Five professors from the Medical Surgical Department. Faculty of Nursing, Ain Shams University and Helwan University, reviewed the tools for clarity, relevance. comprehensiveness, understanding and applicability.

Reliability of the tools:

All tools used in the current study presented good reliability (0.8-0.9). It calculated as follows: structured interview questionnaire Cronbach's Alpha =0.764, The Western Ontario and McMaster Universities Arthritis Index (WOMAC) Cronbach's Alpha =0.846, Pain Disability Index (PDI) Cronbach's Alpha =0.97, & The Visual Analogue Scale (VAS) Cronbach's Alpha =0.87.

Ethical considerations

It was approved by the Research Ethics Committee at the Faculty of Nursing, Helwan University, before the beginning of the actual work. After describing the aim, methods, and significance of the study. Also, the approval was obtained from the hospital before starting the study. In addition, the research's aim was clarified to all studied patients', and confidentiality and anonymity were assured through coding the data and a written informed consent was received from the patient. The studied patients were informed of their right to participate in the study or not, as well as their right to withdraw from it at any moment.

Pilot study

A pilot study was conducted before starting the main study data collection on 10% of study subjects (10 studied patients) to evaluate the recruitment feasibility, and the applicability of the tools. Studied patients who took part in the pilot study were included in the main study subject since there was no difference in the recruitment process. The results of the pilot study confirmed that the study was feasible.

Field of work:

The data was collected from the beginning of November 2022 to end of April 2023 at the Orthopedic and Rheumatology outpatient clinic, at Al Kaser Al Ani Hospital, affiliated to Cairo University, Egypt. Patients were interviewed at outpatient Clinic 4 days per week (Saturday, Sunday, Monday and Wednesday) in the morning from 9 am to 1pm.

The study was conducted through three phases, namely; assessment & planning, implementation and evaluation phase.

1.Assessment& preparatory phase:

The researchers interviewed studied patients involved in the study before the procedure to clarify the aim of the study and give their approval to share in the study. The studied patients are divided into two groups, each group consists of 50 patients randomly selected using a computer. Initial assessment was done using Tool I, datal was collected. The structured interview questionnaire was distributed to the patients (both groups) to answer it by themselves in the presence of the researchers to assess patients' demographic characteristics and their medical history. For the illiterate studied patients the questionnaire was filled out by the researchers. It took 15 minutes to fill this questionnaire. Then the researchers filled out the WOMAC, PDI and VAS for each patient as baseline one time before intervention.

2.Planning phase:

Involved extensive reviewing of the related literatures to develop tools for data collection. It was developed in a simplified Arabic language. The content validity was revised by a group of five experts in the field of Medical-Surgical Nursing to determine the included items are clear and suitable to achieve the aim of the study, and the final modifications were done based on the opinions of the experts. The pilot was done in this phase to assess feasibility of the tools of data collection

3.Implementation phase:

-Group one (hot mud) received direct hot mud application at 45 °C to knees. Mud paste was laid on the skin extending between area 10 cm distal and 10 cm proximal to patella for about 30 minutes daily for repeated 10 days. (The researchers provided hot mud for patients to use at home).

-Preparation of hot mud application in an outpatient clinic, the researchers gather therapeutic mud, heating equipment, towels, sheets, application tools (spatulas and gloves), and cleaning supplies (clean water, towels and sheets). Gradually heat the mud to a safe temperature (40°C to 45°C) while stirring to ensure even heating. Prepare the patient by checking their skin for sensitivities, positioning them comfortably, and protecting their clothing. Apply a thick layer of warm mud (0.5-1 inch) to the treatment area using a spatula or gloved hands, then cover with a towel to retain heat, leaving the mud on for 15-30 minutes. Afterward, gently the researchers remove the mud with a damp towel and moisturize the skin if needed. Finally, clean and sanitize all equipment to maintain hygiene and prevent cross-contamination.

- Group two (revulsive compresses) received revulsive compresses consisting of four minutes of hot by a wet cloth followed by one minute of cold application by a separate wet cloth. This cycle was repeated for six minutes in a total session of 30 minutes per day. The temperature of the water in the basin was maintained constantly at 38°C for hot applications and 15°C for cold application by monitoring continuously through a digital hydro-thermometer (some patients may pay the thermometer and some of them take the thermometer from the researchers during the intervention).

The researchers attend the outpatient clinic 4 times a week; from 9am till 1pm. The researchers met the patient at the Orthopedic and Rheumatology outpatient clinic and the patient was selected according to the inclusion criteria. The researchers get the WhatsApp phone number of each patient and send the leaflet and instructions for follow up to the patients during the next 10 days after the intervention. In addition, telephone calls for compliance verification were made for the intervention everyday post intervention. Telephone calls were also used to screen for potential complications that could require intervention.

Evaluation phase: 10 days after intervention

The post-intervention assessment was completed 10 days after the intervention by using the tools(II,III, IV) WOMAC, PDI and VAS was reassessed and analyzed, and total score was calculated. Higher scores of WOMAC indicated worse pain, stiffness, or physical function. Also, the higher the index of PDI, the greater the patient's disability due to pain. In addition, a higher score of VAS indicates greater pain intensity.

III. Results:

Table (1): Represents that in hot mud pack group there were 70% of women with the mean age of 42.2±5.4 years and in revulsive compress group there were 76% of women with the mean age of 45.4±8.5 years. Regarding level of education, 44% & 50 % had a middle school education in hot mud group and revulsive group respectively. Also, in the hot mud group 72% were married, 46% not working, 64% had insufficient income and 70% live in urban areas. While in the revulsive group 80% were married, 40% office work, 64% had insufficient income and 80% live in urban area.

Table (2): Reveals that in hot mud pack group 44% had HTN as a comorbid disease while in revulsive compress group 38% had HTN. Additionally, in the hot mud group 54% had less than 5 years of disease, 64% had a family history, with mean of body mass index 37.2±9.5. While in revulsive group 48% had less than 5 years of disease, 58% had a family history, with mean of body mass index 33.5±8.7

Table 3: Shows that hot Mud pack group showed an improvement in the mean score of The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in post intervention (p= 0.0001) and reduction in overall score with mean difference 20.3 % (p= 0.000).

Table 4: Revels that revulsive compress group showed an improvement in the mean score of The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in post intervention (P> 0.0001) and reduction in overall score with mean difference 10.4% (P> 0.000).

Table 5: Shows that hot Mud pack group showed an improvement in the mean score of pain disability index in post intervention (P= 0.000) and reduction in overall score with mean difference 12.68% (P> 0.000)

Table 6: Shows that revulsive compress group showed an improvement in the mean score of pain disability index in post intervention (P> 0.000) and reduction in overall score with mean difference 9.91% (P> 0.000).

Table (7) Represents that hot Mud pack group showed a reduction of 12.68% in pain disability index mean scores (P>0.000) and 9.91% reduction in revulsive group (P>0.000), which indicate more reduction in pain in hot mud group.

Table (8) Explains that hot Mud pack group showed a decreasing of 27.45% in VAS scores (P>0.000) and 12.43% decreasing in revulsive group (P> 0.000), which indicate more improvement in pain score in hot mud group.

Table (9) Represents that hot Mud pack group showed a reduction of 20.3% in WOMAC scores (P>0.000) and 10.4% reduction in revulsive group (P> 0.000), which indicate more improvement in pain score in hot mud group.

Figure (1) Shows that 40% of studied patients had mild pain after hot mud pack, while just 8% had extreme pain. In comparison regarding revulsive compresses group 30 % had a mild level of pain while 12% had an extreme feeling with pain, which reflects more improvement in the hot mud pack group.

Table (1): Distribution of the studied patients according to demographic characteristics (n= 100)

Item	Hot Mud pack group (n =50)		Revulsive compress group (n= 50)	
	N	%	N	%
Sex				
- Male	15	30	12	24
- Female	35	**70**	38	**76**
Age				
- 20<40	11	22	18	18
- 40-60	39	**78**	32	**64**
Mean ±SD	42.2±5.4		45.4±8.5	
Education				
- Illiterate	6	12	4	8
- Read and write	10	20	8	16
- Middle school	22	44	25	50
- High school	12	24	13	26
Marital status				
- Single	10	20	7	14
- Married	36	72	40	80
- Widowed/ Divorced	4	8	3	6
Occupation				
- Manual work	9	18	12	24
- Office work	18	36	20	40
- Not working	23	46	18	36
Income				
- Sufficient	18	36	21	42
- Insufficient	32	64	29	58
Place of residence				
- Urban	35	70	40	80
- Rural	15	30	10	20

Table (2): Distribution of the studied patients according to medical history (n= 100)

Items	Hot Mud pack group (n= 50)		Revulsive compress group (n= 50)	
	N	%	N	%
Comorbidity				
- HTN	22	**44**	19	**38**
- DM	15	30	17	34
- Both	7	14	10	20
- None	6	12	4	8
Duration of disease				
- Less than 5 years	27	**54**	24	**48**
- 5 – 10	19	38	21	42
- More than 10 years	4	8	5	10
Family history of Osteoarthritis				
- Yes	32	**64**	29	**58**
- No	18	36	21	42
Body mass index (BMI) (Mean ±SD)	37.2±9.5		33.5±8.7	

Table (3): Comparison of The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pre and post Hot mud pack intervention (n=50)

WOMAC related dimensions	Pre	Post	T	P
	Mean ±SD	Mean ±SD		
Pain score (0 to 20)	11.12±**0.62**	8.12±**1.83**	10.19	**0.000****
Stiffness score (0 to 8)	5.22±**0.81**	3.08±**0.77**	5.77	**0.000****
Physical functional score (0 to 68)	44.14±**1.01**	32.60±**0.53**	3.65	**0.001***
Overall score (0 to 96)	48.4±**21.3**	28.1±**10.5**	7.88	**0.000****

*Statically significant P>0.5   ** highly statistically significant P>0.001*

Table (4): Comparison of The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pre and post revulsive compress intervention (n=50)

WOMAC related dimensions	Pre	Post	T	P
	Mean ±SD	Mean ±SD		
Pain score (0 to 20)	14.12±**0.62**	6.12±**1.83**	13.19	**0.000****
Stiffness score (0 to 8)	5.33±**1.16**	2.85±**1.27**	13.77	**0.000****
Physical functional score (0 to 68)	42.24±**5.43**	29.57±**1.2**	2.65	**0.001***
Overall score (0 to 96)	46.3±**11.3**	35.9±**9.5**	8.12	**0.000****

*Statically significant P>0.5   ** highly statistically significant P>0.001*

Table (5): Comparison of pain disability index mean score pre and post Hot mud pack intervention (n=50)

Pain disability index categories	Pre	Post	T	P
	Mean ±SD	Mean ±SD		
Family / home responsibilities	5.33±**1.16**	2.67±1.13	35.63	**0.000****
Recreation	5.50±0.96	2.55±1.36	44.13	**0.000****
Social activity	5.77±0.56	2.42±1.20	79.27	**0.000****
Occupation	5.23±**1.23**	2.45±**0.9**	23.51	**0.000****
Sexual behavior	3.54±**2.41**	1.52±**2.1**	12.56	**0.000****
Self-care	5.78±**1.56**	2.58±**1.7**	24.72	**0.000****
Life-support activities	5.54±**2.5**	2.28±**1.40**	13.45	**0.000****
Total	34.58±**5.38**	21.9±**6.65**	23.87	**0.000****

*Statically significant P>0.5   ** highly statistically significant P>0.001*

Table (6): Comparison of pain disability index mean score pre and post revulsive compress

Pain disability index categories	Pre	Post	T	P
	Mean ±SD	Mean ±SD		
Family / home responsibilities	5.45±1.15	2.67±1.42	23.42	0.000**
Recreation	5.15±1.58	2.55±1.25	25.62	0.000**
Social activity	5.56±1.8	2.42±1.14	32.75	0.000**
Occupation	5.83±1.5	2.45±1.9	24.12	0.000**
Sexual behavior	3.73±2.64	1.52±2.5	32.32	0.000**
Self-care	5.59±1.7	2.58±1.8	25.23	0.000**
Life-support activities	5.58±2.91	2.28±1.10	21.22	0.000**
Total	42.45±6.41	32.54±5.7	25.13	0.000**

intervention (n=50)

*Statically significant P>0.5   ** highly statistically significant P>0.001*

Table (7): Comparison of pain disability index mean score pre and post Hot mud pack and revulsive compress intervention (n=100)

| Variables	Pre	Post	Mean difference	t	P
	Mean ±SD	Mean ±SD			
Hot Mud pack	34.58±5.38	21.9±6.65	12.68	16.8	0.000**
Revulsive compress	42.45±6.41	32.54±5.7	9.91	4.04	0.000**

*Statically significant P>0.5   ** highly statistically significant P>0.001*

Table (8): comparison of A Visual Analogue Scale (VAS) means score pre and post Hot mud pack and revulsive compress intervention (n=100)

Variables	Pre	Post	Mean difference	t	P
	Mean ±SD	Mean ±SD			
Hot Mud pack	72.3±8.15	45.3±11.42	27.45	16.8	0.000**
Revulsive compress	74.6±9.37	63.1±9.5	12.43	4.04	0.000**

*Statically significant P>0.5   ** highly statistically significant P>0.001*

Table (9): comparison of Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) mean score pre and post Hot mud pack and revulsive compress intervention (n=100)

Variables	Pre	Post	Mean difference	t	P
	Mean ±SD	Mean ±SD			
Hot Mud pack	48.4±21.3	28.1±10.5	20.3	6.22	0.000**
Revulsive compress	46.3±11.3	35.9±9.5	10.4	1.86	0.006*

*Statically significant P>0.5   ** highly statistically significant P>0.001*

Figure (1) pain severity level post intervention (%) (n=100)
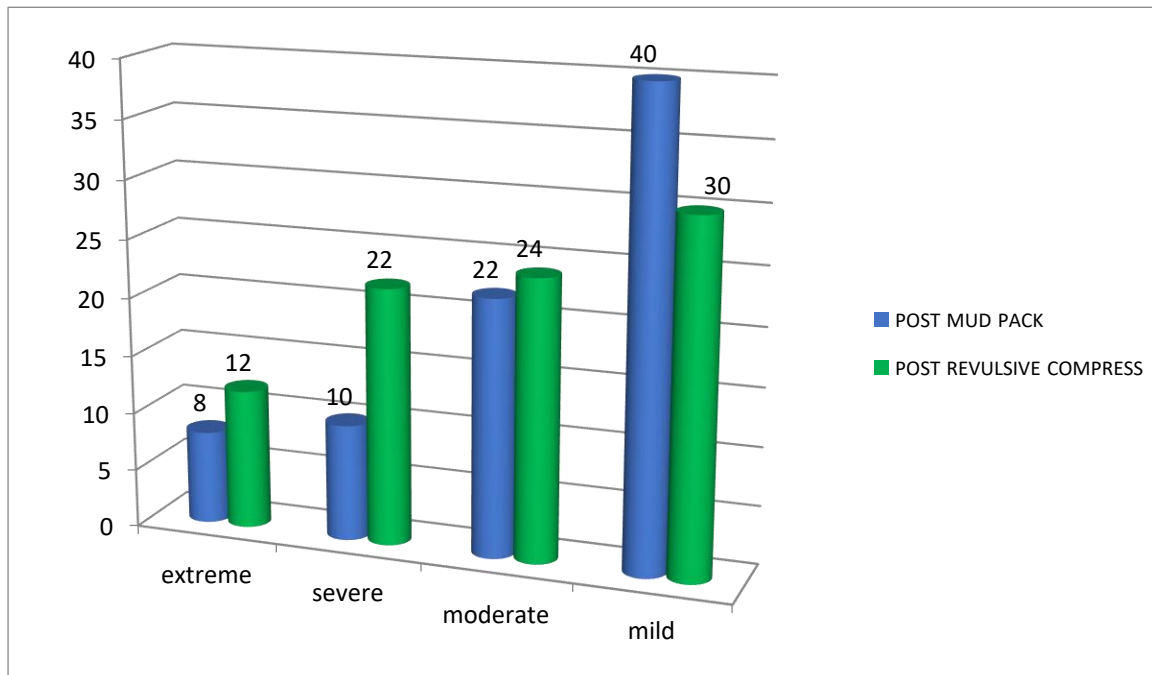
IV. Discussion:

Knee osteoarthritis recognized as degenerative joint disease of the knee; it is typically the result of advanced loss of articular cartilage that leads to severe pain. application of hot mud decrease pain through apply the mud heated to 42°C (107.6-degree F) with the utilize of hot water then it will be applied to the affected Knee 10 minutes of alternate days for the period of 30 days, it considers better treatment to reduce and controlling KOA **(Chandra et al., 2020).** **Regarding Socio-demographic characteristic of the studied patients:**

The finding pf current study illustrated that the majority of studied patients aged 40 – 60 years old apply hot mud application while about two third of them apply revulsive compress; and two thirds of female in this study use hot mud application and three quarter of them use revulsive compress. The rational of the previous finding because KOA is common in women than men. This because the hormonal changes, particularly after menopause and osteoporosis, which can elevate the risk of KOA because estrogen withdrawal, which exacerbate degenerative changes in multiple joints, muscle strength changes, muscle and more fat cluster loading on joints, pelvic structures, and knee **(Basuny, & et al., 2020).**These finding likewise with **Srour, & Saad, (2022)** in their study of Effect of Revulsive Compresses on Knee Associated Symptoms and Pain Severity among Patients with Knee osteoarthritis. In Egypt, they showed that the majority of study subjects were female.

Regarding the studied patient's education, this study results showed that , in group one (hot mud application) less than half of studied patients have middle school education while group two (revulsive compresses) half of them have middle school education these finding goes on the same line as **Fioravanti et al., (2022)** who study " Mechanism of action of action of spa therapies in rheumatic diseases" and showed that less than half their education was secondary education assigned hot mud application while half of participants secondary education assigned revulsive compress.

The current study finding explained that in group one (hot mud application) more than two thirds of studied patients were married, and less than half of the studied patients not working. While in group two (revulsive compresses) the majority of them were married, more than one third of them who not working, these results agreement with **Oosterveld et al., (2023)** who study " Treating arthritis with locally applied heat or cold compress" who mentioned that in group one (hot mud application) the majority of participants were married, and less than half of participants do not work related to arthritis pain. In the group two (revulsive compresses) the majority of studied patients were, and slightly more than one third of them do not work related to the same cause. From researchers' point of view the participants can't be able to work related to arthritis pain so that resort to apply pain relieve methods as hot mud or revulsive compress.

Concerning the studied patient's income, the finding of this study showed that in group one (hot mud application, less than half of studied patients had insufficient income, while in group two (revulsive compresses) more than half of studied patients had insufficient income. The previous finding was in the same line with **Srour& Saad, (2022)** who cleared that the majority of participants who complain of insufficient income apply revulsive compress. From researchers' point of view the studied patients who had insufficient income assigned to hot mud or revulsive compress because cheaper in price than analgesic. In addition, the majority of those patients has a chronic illness and they administer a lot of medication that affect stomach ulcer. Using of nonpharmacological pain and symptoms relive may be the best choice.

In connection with studied patients' residence, the finding of this study showed that two thirds of them live in urban areas using hot mud application while most of them practice revulsive compress. These finding was accordance with **Mabboob et al., (2020)** who study "The efficacy of a topical gel prepared using Lake Urmia mud in patients with knee osteoarthritis" who clarified less than half of studied participants had insufficient income and majority of them live in urban area use hot mud. From researchers' point of view the participants' interest seeks to decrease use of drugs treatment.

Concerning medical history of studied patients:

The current study results showed one third of studied patients apply hot mud application complains with diabetes mellitus while more than one third of them use revulsive compress complain with hypertension these results disagree with **Antunez et al., (2022)** who study "Effects of mud therapy on perceived pain and quality of life related to health in patients with knee osteoarthritis" and illustrated that all participants complain from diabetes apply hot mud to minimize knee osteoarthritis pain.

Regarding patients' family history with OA the finding of current study showed that more than two thirds of the subject usage hot mud application had family history of OA while more than half of them had family history with OA use revulsive compress. This finding in the same line with **Kellgren and Lawrence, (2021),** who study "Radiological assessment of osteoarthritis" and showed that more than two thirds of subject had family history with osteoarthritis. From researchers' point of view the family history play significant role in an inherit how to deal with osteoarthritis pain through apply hot mud or revulsive compress.

The results in this study showed that the body mass index mean ± SD for studied subject apply hot mud application was 37.2±9.5 while the body mass index mean ± SD for studied subject who use revulsive compress was 33.5±8.7. The interpretation of the previous finding because both groups in grade II obesity, this risk factor for KOA. **Basuny, & et al., (2020)** mentioned that fatty female, and over 50 years age have been significantly associated with increased KOA risk. This may be due to increased strain on the articular cartilage, which speeds up degeneration. However, researches have shown that obesity is also positively linked to OA prevalence in non-bearing joints like the hand. The finding Supported with **Sarsan et al., (2023)** who study **"**Comparing the efficacy of mature hot mud pack and hot pack treatments

for knee osteoarthritis" who observed that the body mass index means ± SD use hot mud pack treatments for knee osteoarthritis was 28.68±9.38. Moreover, **Giannini and Crepaldi (2020)** who study "Cytokine levels in osteoarthrosis patients undergoing revulsive compress therapy" The results of this study cleared the body mass index by mean ± SD for participants who use revulsive compress therapy was 30.58±7.97. That emphasize by **Luis et al., (2020)** in a study entitled "Effects of Mud Therapy on Perceived Pain and Quality of Life Related to Health in Patients with Knee Osteoarthritis" and showed the hot mud stimuli influence pain severity; the hot mud therapy minimize   the circulating levels of prostaglandin E2 (PGE2) consider the perfect compress to control of inflammation and pain.

   Concerning the effect of hot mud application versus revulsive compress on controlling knee osteoarthritis associated pain
   The finding in the current study showed an improvement in the comparison of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) post than pre hot mud application by mean ± SD (post 28.1±10.5 while pre-48.4±21.3) with highly statistically significant P>0.001. This results was accordance with **Abe et al., (2023)** who study "Investigation of generalized osteoarthritis by combining x-ray grading of the knee, spine and hand using biochemical markers for arthritis in patients with knee osteoarthritis by using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)" and cleared that progress the results of comparison of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) post hot mud application than pre with highly statistically significant P>0.001. The rational of the previous finding may be attributed to the therapeutic benefits of hot mud application for osteoarthritis, reinforcing its potential as an effective non-pharmacological intervention to improve joint function and reduce symptoms. This consistency across studies strengthens the evidence for incorporating hot mud therapy into osteoarthritis management protocols.

   The finding in current study displayed progress in comparison of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) post than pre revulsive compress intervention by mean ± SD (post was 35.9±9.5 while pre was 46.3±11.3) with highly statistically significant P>0.001. These results agree with **Hoeksma et al., (2021) who study** "Comparison of manual therapy and exercise therapy in osteoarthritis of the hip: a randomized clinical trial" who illustrated that an improvement Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) post than pre revulsive compress intervention with highly statistically significant P>0.001. From the researchers' point of view, the rational of the previous finding may be the potential of revulsive compress therapy as an effective treatment for reducing osteoarthritis symptoms, reinforcing its usefulness in clinical practice.

   The current study results revealed that an improvement in comparison of pain disability index mean score post than pre hot mud application intervention by mean ± SD post hot mud application intervention 21.9±6.65 while pre was 34.58±5.38 with highly statistically significant P>0.001. The rationale of previous finding may because the beneficial impact of non-pharmacological therapies like hot mud application in alleviating pain and improving quality of life for patients with osteoarthritis. This finding was in agreement with **Roos et al., (2022)** in his study of "WOMAC osteoarthritis index. Reliability, validity and responsiveness in patients with arthroscopically assessed osteoarthritis" who displayed an improvement in comparison of pain disability index mean score post than pre hot mud application intervention with highly statistically significant P>0.001.The decreasing in pain can be interpreted by the substances in aqueous mud extracts which can enter across the human skin thus having the definite effects on spontaneous contractile activity of the smooth muscle tissue and also to the elevate secretion of certain cytokine. Application of hot mud pack decreases the plasma levels

of interleukin, tumor necrosis factor – α, and matrix metalloproteinase and thereby minimizing the inflammation of the cartilages and the tissue **(Dinesh, et al.,2019)**.

The finding of this study showed that progress in the comparison of pain disability index mean score post than pre of hot mud application and revulsive compress intervention by mean ± SD (post 32.54±5.7 while pre was 42.45±6.41) with highly statistically significant P>0.001. This results on the same direction with **Tefner et al., (2023)** who study "a randomized, controlled double –blind follow-up pilot study" and mentioned that an improvement in difference between pain disability index mean score post than pre of hot mud application and revulsive compress intervention mean ± SD (Post 30.78 ± 8.47 and Pre 34.85±5.64) with highly statistically significant P>0.001. The interpretation of the previous finding may be attributed with the effectiveness of hot mud and revulsive compress therapies in reducing pain and improving functionality in patients with conditions related to pain and disability.

The finding in the present study showed an improvement in the comparison of A Visual Analogue Scale (VAS) post than pre revulsive compress intervention by mean ± SD (post 32.54±5.7 while pre-42.45±6.41) with highly statistically significant P>0.001. This results in the same line of **Abd Allah et al., (2020)** who study "Effect of Lifestyle Modification Intervention Program among Adults Suffering from Osteoarthritis knee" in Egypt and showed an upgrading in the difference between post than pre of A Visual Analogue Scale (VAS) revulsive compress therapy by mean ± SD (post 29.87±6.9 while pre 47.98 ± 8.874) with highly statistically significant P>0.001. The rational of the previous finding may because the effectiveness of revulsive compress, and hot mud application therapy in alleviating pain, reinforcing its therapeutic potential for managing osteoarthritis and related pain conditions.

The results of the current study mentioned that improvement in the comparison of pain disability index mean score post than pre of the hot mud application (post 45.3±11.42 while pre-72.3±8.15); also progress in comparison of pain disability index mean score post than pre of revulsive compress (post 63.1±9.5 while pre-74.6±9.37) with highly statistically significant P>0.001. These finding agree with **Archanah et al., (2023)** who study "Effect of a hydrotherapy based alternate compress on osteoarthritis of the knee joint: a randomized controlled trial" and cleared highly statistically significant and improvement in the comparison of pain disability index mean score post than pre of the hot mud compress.

Current study results cleared VAS improvement in the comparison between post than pre of hot mud application by mean ± SD (post 63.1±9.5 while pre-45.3±11.42) with highly statistically significant P>0.001. And WOMAC improvement comparison post than pre hot mud application by mean ± SD (pre-28.1±10.5 while post 35.9±9.5) with statistically significant P>0.05. These results agree with **Archanah et al., (2023)** who display that progress in the VAS comparison between post than pre of hot mud application and improvement in WOMAC comparison post than pre hot mud application with highly statistically significant differences.

The present finding in this study showed less than one quarter of studied subject have no pain post hot mud application while minority of them have no pain post revulsive compress. And these results agree with **Denegar et al., (2020**) who study "Preferences for heat, cold, or contrast in patients with knee osteoarthritis affect treatment response" 29% of the participants have no pain post hot mud compress while 9% of them have no pain post revulsive compress

V. Conclusion & recommendation:

Based on the findings of the current study, it can be concluded that after implementing hot mud application and revulsive compresses, there were effective improving symptoms and reliving pain severity of patients with knee osteoarthritis. But implementation of hot mud application

has effect better than revulsive compresses improving symptom and reducing the pain severity of patients with knee osteoarthritis.

- The early strategies for treating patients with knee osteoarthritis should include alternative therapy as hot mud application & revulsive compresses to minimize pain and improve the associated symptoms for those patients.

- Continuously monitor patient responses to hot mud application and revulsive compresses, and evaluate the effectiveness of these treatments in improving symptoms and reducing pain. Adjust treatment plans as necessary based on patient feedback and clinical outcomes.

-Educate patients on the benefits of hot mud application and revulsive compresses, including proper application techniques and expected outcomes, to enhance adherence and maximize therapeutic benefits.

- Further Research to encourage further research to explore the long-term effects, optimal

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الملخص العربي

تأثير تطبيق الطين الساخن مقابل الكمادات الترددية للتحكم في الآلام المصاحبة لالتهاب مفصل الركبة

المقدمة: يعتبر مرض التهاب مفصل الركبة السبب الأكثر شيوعًا لآلام الركبة لدى كل من البالغين وكبار السن. يُستخدم تطبيق الطين الساخن والكمادات الترددية على نطاق واسع في علاج أمراض إلتهاب مفصل الركبة لتخفيف الألم.

الهدف من الدراسة: المقارنة بين تأثير تطبيق الطين الساخن مقابل الكمادات الترددية للتحكم في **الآلام** المصاحبة لالتهاب مفصل الركبة.

التصميم ومكان البحث: تم استخدام تصميم شبه تجريبي لإجراء هذة الدراسة. أجريت هذة الدراسة في العيادات الخارجية التابعة لقسم العظام والروماتيزم بمستشفي القصر العيني التابعة لجامعة القاهرة في مصر.

عينة البحث: تألفت العينة من 100 مريض بالغ (من الجنسين) مصابين بالتهاب مفصل الركبة تم توزيعهم عشوائيا بالتساوي على مجموعتين كل منهما (العدد = 50). تلقت المجموعة الأولى تطبيق الطين الساخن المباشر، بينما تلقت المجموعة الثانية تطبيق الكمادات الساخنة ثم الكمادات الباردة بالتناوب (الكمادات المترددة).

أدوات جمع البيانات: تم استخدام أربع أدوات لجمع البيانات: الأداة الأولى: استبيان المقابلة الشخصية. تتكون هذه الأداة من جزأين: الجزء الأول: الخصائص الاجتماعية والديموغرافية للمريض، الجزء الثاني: التاريخ الطبي للمريض. الأداة الثانية: مؤشر التهاب المفاصل لجامعتي ويسترن أونتاريو وماكماست(WOMAC) الأداة الثالثة: مؤشر إعاقة الألم، والأداة الرابعة: المقياس التناظري البصري.

النتائج: كان هناك فروق ذو دلالة إحصائية عالية بعد تطبيق الطين الساخن والكمادات الترددية (0.000 > P) في تحسين الأعراض وتقليل شدة الألم أفضل من الكمادات الترددية للتحكم في الآلام المصاحبة لالتهاب مفصل الركبة.

الخلاصة: تطبيق الطين الساخن له تأثير أفضل من الكمادات الترددية في تحسين الأعراض وتقليل شدة الألم بين المرضى الذين يعانون من التهاب مفصل الركبة.

التوصيات: أوصت الدراسة بضرورة استخدام أستراتيجيات حديثة لعلاج مرضي إلتهاب مفصل الركبة ومنها العلاج البديل مثل إستخدام الطين الساخن والكمادات الترددية مما لها أثر فعال في تقليل الألم وتحسن الأعراض المصاحبة.

الكلمات الرئيسية:
إلتهاب مفاصل الركبة، تطبيق الطين الساخن، الكمادات الترددية، الألم