POSSIBLE ROLE OF USING NATURAL ENVIRONMENTALLY SELECTED HERBAL EXTRACTS MIXTURE ON MANAGING PHYSICAL DISABILITY

Mostafa A. Abo Shokka[(1)]; Mostafa H. Ragab[(2)]; Mohamed S. Mostafa[(3)] Mervat A. Mohamed[(4)]; Ayman M. A. Hamouda[(5)]; George M. Mekhail[(6)] and Nadia F. M. Deyab[(7)]

1) National Heart Institute 2) Faculty of Graduate Studies and Environmental Research, Ain Shams University 3) Faculty of Postgraduate Childhood Studies, Ain Shams University 4) Faculty of Physical Therapy, Sphinx University 5) Horticulture Research Institute 6) Faculty of Pharmacy, Ain Shams University 7) Global Care Hospital.

ABSTRACT

Background and purpose: Osteoarthritis is a disease that accounts for most knee joint replacement surgeries and lost efficacy at work and is the most common cause of musculoskeletal pain and disability in adults. This study was designed to investigate the role of using natural environmentally selected herbal extracts mixture on managing physical disability caused by primary knee osteoarthritis. The selected herbal extracts were camphor, peppermint, ginger, clove, black seed, and garden cress oil extracts in ointment base.

Subjects and method: Eighty patients were recruited from outpatient clinic at National Heart Institute and enrolled in this study. They were suffering from grade (C) knee osteoarthritis and had disability in daily living activities. They were divided randomly into two equal groups: a study group, patients received physical therapy program for 12 sessions, in addition to applying a topical ointment containing the selected mixture of herbal oils, and they were instructed to rub the affected area with the ointment twice daily, and a control group received a physical therapy program and a placebo ointment. Dynamic knee pain during walking and functional mobility was assessed.

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Results: Statistical analysis revealed a significant improvement (p=0.001) in dynamic knee pain during walking in the study group compared to control group. Functional mobility showed a significant difference (p= 0.001) in the favor of study group as well.
Conclusion: Using such mixture of herbal extracts in combination with regular physical therapy program can decrease knee joint pain during walking, which permit more functional mobility for patients with grade (C) osteoarthritis thus helping in decrease physical disability and regain their health-related quality of life.
Key words: osteoarthritis, physical disability, herbal treatment, knee pain, physical therapy.

INTRODUCTION

Musculoskeletal diseases are often the source of physical impairments. Each year, 15% of patients on a general practitioner's list visit their physician with a loco-motor issue, and such disorders account for 20% – 25% of a general practitioner's workload in the United Kingdom. Around 30% of people with any kind of physical impairment, and 60% of those with severe disabilities, have a musculoskeletal disease as the main source of their difficulties, (Colebatch, *et al*., 2017).

Osteoporosis and osteoarthritis (OA) are regarded as significant public health concerns. Numerous studies have shown that traditional medicine has a beneficial impact on bone health. Bone turnover indicators are advantageous in the treatment of bone disorders. (De Leon-Casasola, 2013)

Arthritis is a musculoskeletal system disease caused by mechanical and biological processes that disrupt the normal coupling of cartilage degradation and synthesis, (Man, and Mologhianu, 2014).

The weight-bearing joints such as the feet, knees, hips, and spine are the most often impacted by arthritis, which ultimately leads to inflammation, discomfort, joint stiffness, and loss of motion, resulting in functional impairment, (Hsu, and Siwiec, 2021).

The primary symptom of osteoarthritis is inflammation, which results in all patient's complaints, including pain, swelling, and loss of function. Inflammation is caused by the production of an inflammatory mediator, arachidonic acid, which is metabolized through the COX and LOX pathways to produce prostaglandins and leukotrienes (inflammatory mediators), (Hsu, and Siwiec, 2021).

Academy of Orthopaedic Physical Therapy, (2021) stated that patients suffering from osteoarthritis of the knee tried to alleviate their discomfort by decreasing the knee extensor moment. In the knee joint, contact forces are proportional to the net external moment. When a big internal moment is required to balance a large external moment, a significant contact force is produced.

Kaufman, *et al*. (2001) compared the gait characteristics of osteoarthritic patients and normal individuals and concluded that patients with osteoarthritis walked slower. For both stair climb and descent, these variations in walking velocity were statistically significant.

They noted that individuals with OA had a substantially lower peak knee extension moment than normal participants. The time of the maximal knee

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extension moment was substantially delayed in individuals with OA during stair climbing, (Kaufman, *et al*., 2001).

For the grading of osteoarthritis in the knee, the International Knee Documentation Committee (IKDC) system is regarded to have the most favorable combination of interobserver precision and correlation to knee arthroscopy findings. It was formed by a group of knee surgeons from Europe and America who met in 1987 to develop a standard form to measure results of knee ligament reconstructions (table 1), (Wright, 2014).

Table (1): International Knee Documentation Committee (IKDC) system

Grade	Findings
A	No joint space narrowing, defined in this system as at least 4 mm joint space
B	At least 4 mm joint space, but small osteophytes, slight sclerosis, or femoral condyle flattening
C	2–4 mm joint space
D	<2 mm joint space

Wright, (2014)

The World Health Organization (WHO) defines traditional medicine as "the sum total of knowledge, skills, and practices based on indigenous theories, beliefs, and experiences, whether explicable or not, used in the maintenance of health as well as the prevention, diagnosis, improvement, and treatment of physical and mental illness." Traditional medicine is a collection of knowledge and practices that have been collected over time and passed down from generation to generation with the goal of curing illnesses and maintaining health. When traditional medicine, also known as indigenous

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medicine, is performed outside of its cultural context, it is referred to as "alternative medicine", (WHO traditional medicine strategy, 2013).

Numerous essential oils have been discovered to possess a range of biological characteristics, including spasmolytic, anxiolytic, and antinociceptive action. These effects are most likely a result of the essential oil components' great structural variety, (Badgujar, *et al*., 2014).

In other words, there are many essential oils that reduce pain and inflammation. Certain essential oils are analgesics, which means, they alleviate pain. Other essential oils have anti-inflammatory properties and are helpful for treating rheumatic and arthritic pain. Numerous essential oils also aid in the relaxation of muscles and the calming of nerves under the skin. Additionally, it is good to combine many of them for a larger impact, (Hebert, *et al*. 2014).

According to Egypt Soc Parasitol (2002), camphor-based oils are recognized to alleviate pain associated with joints, arthritis, sciatica, sprains, and backaches. These oils are concentrated and more effective in relieving pain associated with severe muscular-skeletal conditions such as lumbago, muscle damage, sciatica, sprain, stiffness, edema, discomfort, and joint inflammation. As a result, it is helpful in the treatment of rheumatoid arthritis and rheumatoid arthritis. This is due to the anti-inflammatory and analgesic effects of camphor. As a result, it may halt future worsening or provide some relief from the illness, (Chunkath, 2012).

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Peppermint has traditionally been used as a topical analgesic and as a skin coolant. Peppermint oil activates cold receptors on the skin and dilates blood vessels, producing a cooling feeling and analgesic action (Balakrishnan, 2015). On the other hand, menthol is a topical vasodilator that helps other topical skin medicines absorb more readily. Menthol has a cooling effect when applied topically in low quantities but produces irritation and local anesthetic when applied in high doses. (Ciccone, 2017)

Ginger also has a lengthy medical history, having been used for over 2,500 years in Ayurvedic and Chinese medicine as an anti-inflammatory agent for musculoskeletal disorders, including rheumatism, (Altman, and Marcussen, *et al*. 2001). Clove is an anti-inflammatory agent owing to its high flavonoid concentration. Aromatherapists utilize pure clove oil to treat rheumatism and arthritic symptoms. (Milind and Deepa, 2011)

Additionally, researchers examined black seed extract's anti-inflammatory and analgesic properties. In 1995, a group of scientists from King's College London's Department of Pharmacy discovered that the extract has anti-inflammatory, analgesic, and antioxidant properties. Finally, the researchers concluded that black cumin seed extract is a viable therapy option for rheumatoid arthritis and other inflammatory conditions, (Hussain, and Hussain, 2016).

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Lepidium Sativum, often known as Garden cress, is a member of the Brassicaceae family. It was first cultivated in eastern areas centuries ago and subsequently expanded globally. It is very well-known in traditional medicine. Garden cress is well-known for its strong odor owing to the presence of numerous volatile oils and was historically used to cure a variety of conditions, including muscular discomfort, inflammation, and bone fractures. (Falana *et al*., 2014)

PATIENTS AND METHODS

An interventional hospital-based study was performed on 80 patients who were suffering from knee osteoarthritis causing musculoskeletal disability.

The study was conducted in the outpatient clinic, Physical Therapy Department, National Heart Institute, Imbaba. Volunteer patients were referred from the outpatient orthopedic clinic of Imbaba General Hospital to the department of physical therapy in National Heart Institute. All patients were diagnosed – in Imbaba General Hospital – before referral and suitable medications were prescribed for each case.

This study has been conducted through several steps, starting from the picking of the used parts of the herb to the actual experimental phase on patients. This study was conducted from 1st of December 2018 till 1st of December 2020.

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I. **Preparation phase:** The herbs - that constitute the mixture - were chosen based on their effects that mentioned previously in the introduction

i. **Picking phase**: The right places were chosen to get the selected herbs, then the plant parts were picked correctly and preserved in a refrigerator (at a temperature of 5 degree) of the Center for Medical Plant Research-Horticultural Research Center, to protect them from drying until the oils were extracted from them. The following table (2) shows the location of the picked part.

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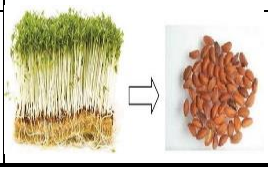
Table (2): Location of picking of the selected plants and picked part

Plant	Location	Picked part	Picture
S.N: Eucalyptus citriodora C.N: Camphor	Farm in Cairo-Alex Road	Wood (Britannica, 2019)	
S.N: Mentha x piperita vulgaris – L. C.N: Peppermint	Farm in Cairo-Alex Road	Leaves (Britannica, 2019)	
S.N: Zingiber officinale C.N: Giger	Farm in Cairo-Alex Road	Rhizomes (Adamade, *et al*., 2017)	
S.N: Syzygium aromaticum C.N: Clove	Farm in Cairo-Alex Road	Flower buds (Ratri, *et al*., 2020)	
S.N: Nigella sativa C.N: Black seeds	Farm in Cairo-Alex Road	Seeds (Mohammed, *et al*., 2016)	
S.N: Lepidium sativum C.N: Garden cress	Farm in Cairo-Alex Road	Seeds (Yenge, *et al*., 2017)	

S.N.: Scientific Name; C.N.: Common Name

ii. **<u>Oil extraction phase</u>**: The extraction phase of oils included the method and technique of extraction for each is shown in the following Table (3).

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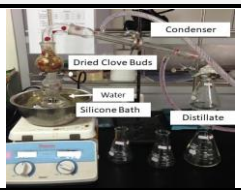
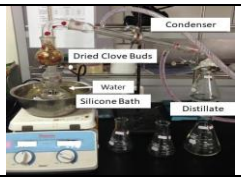
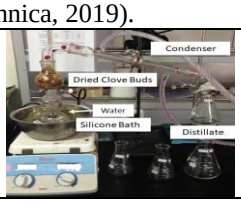
Table (3): Oil extraction methods

Plant	Oil extraction method	Laboratory	Picture
S.N: Eucalyptus citriodora C.N: Camphor	Steam distillation of wood	Medicinal and Aromatic Plants Laboratory	
	Technique: The oil is isolated by passing steam through the pulverized wood and condensing the vapours; camphor crystallizes from the oily portion of the distillate and is purified by pressing and sublimation, (Britannica, 2019).		
S.N: Mentha x piperita vulgaris - L. C.N: Peppermint	Steam distillation of the leaves	Medicinal and Aromatic Plants Laboratory	
	Technique: The oil is isolated by passing steam through the peppermint leaves and condensing the vapours. At 40 °C, the distiller's temperature rises quite quickly and already around 85 - 90 °C the first droplets of distillate was seen coming out, (Britannica, 2019).		
S.N: Zingiber officinale C.N: Giger	Steam distillation of dried rhizomes	Medicinal and Aromatic Plants Laboratory	
	Technique: The dried rhizomes were ground to coarse powder and loaded into a still. Steam was passed through the powder, which extracts the volatile oil components. The steam was then condensed with cold water. As the steam condenses, the oils separated out of the steam water and were collected, (Adamade, *et al*. 2017).		

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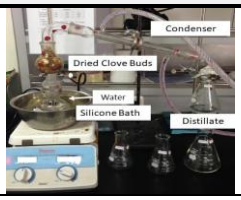
Cont. Table (3):

Plant	Oil extraction method	Laboratory	Picture
S.N: Syzygium aromaticum C.N: Clove	Steam distillation of freshly ground dry buds	Medicinal and Aromatic Plants Laboratory	
	Technique: Dried clove buds was put in steam flask. The steam distillation was conducted in several times. The time started to be counted when first drop of distillate comes out. Then, the collected distillate was extracted furthermore with n-hexane as solvent using separatory funnel. Clove oil was obtained by evaporating the n-hexane, (Ratri, *et al*., 2020).		
S.N: Nigella sativa C.N: Black seeds	Solvent extraction (By liquid CO_2)	Medicinal and Aromatic Plants Laboratory	
	Technique: The dried seeds were completely crushed for 3-4 min in a stainless-steel grinder and kept in an extractor container of the same material and tightly sealed. Supercritical fluid extractions were conducted at pressures of 600 bar and temperatures of 40°C for the duration of 1 h, and liquid CO_2 was injected at approximately 150 L/hour and controlled by an automatic back pressure regulator., (Mohammed, *et al*., 2016).		
S.N: Lepidium sativum C.N: Garden cress	Solvent extraction (By petroleum ether)	Medicinal and Aromatic Plants Laboratory	
	Tecnique: Seeds were ground using grinder A lab scale Soxhlet apparatus (Make: Borosil; Model: Hot extraction unit with 250 mL flat bottom flax) was used to extract oil from garden cress seeds. About 20 g of ground seed flour was used for the extraction with petroleum ether, (Yenge, *et al*., 2017).		

S.N: Scientific Name; C.N: Common Name

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Oil extracts have been stored according to quality standards of ISO/TS 210:2014 to ensure that oils are not damaged or spoiled by air or photooxidation or rot due to moisture.

iii. **Final preparation phase**: The oil extracts were mixed with suitable ointment base using the mortar and pestle method in the laboratory of the faculty of pharmacy, Ain Shams University, then stored in 100-gram plastic jars with a specific symbol indicating the contents.

After 30 not recorded initial trials of mixing concentration to see the best effect of the mixture has been made, final modification of these concentrations in this experiment in table (4).

Table (4): Concentration of essential oils in the ointment base

Oil	Concentration	Reference
Camphor	3 %	Cohen, *et al*., 2003
Peppermint	2 %	Kligler, and Chaudhary, 2007
Ginger	2.5 %	Komeh-Nkrumah, *et al*., 2012
Clove	2.5 %	Tisserand, 2013
Black seed	2 %	Dawoud, 2015
Garden cress	2 %	Falana, *et al*., 2014

Sensitivity test was performed to confirm safety on skin

Ointment base free of any active substances (placebo) for the control group was prepared in the same type of packaging with a different symbol than the symbol given to the study group packages.

Implementation phase:

1- Tools:

a- Assessment tools:

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1- Weight scale to measure the weights of the patients.

2- Tape measurement to measure the height of the patients.

3- Goniometer to assess range of motion

b- Treatment tools

1- Plastic jars containing 100 mg of the mixture of camphor, peppermint, ginger, clove, black seed, and garden cress seeds essential oils, these oils were mixed – as mentioned – with proper percentages in ointment base for easy acceptable application.

2- Plastic jars containing 100 mg of placebo ointment for control group.

3- Regular physical therapy program tools: electrical stimulation device, ultrasonic device, ice packs, and free weights.

2- **Sampling technique:** By simple random sampling, the sample was collected. When a patient was referred to the physical therapy department, initial interview was held include:

- The orthopedist referral sheet in which mention the degree of knee osteoarthritis.
- Applying the patient's data sheet (Dennis, *et al*., 2008).

Through the patient's data sheet, the patient's criteria were evaluated if followed inclusion and exclusion criteria considerations or not.

Inclusion criteria:

- Age from 50 to 60 years' old

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- Suffering from grade C knee osteoarthritis according to International Knee Documentation Committee (IKDC) system (table 1) (Wright, 2014).
- Disability in daily living activities developed due to knee osteoarthritis

Exclusion criteria:

- Disabilities due to other musculoskeletal disorders such as back pain, hip pain etc.
- Disabilities due to autoimmune diseases such as rheumatic arthritis.
- Disabilities due to neurological disorders such as Parkinsonism, multiple sclerosis, cerebrovascular stoke and spinal cord injuries etc.
- Psychiatric problems in which, patients cannot express themselves.

a- **Assessment procedure:** When a patient was chosen for the research, he/she was asked to be recruited in the sample. After initial acceptance, the patient was informed with the details of the study and its aim (except informing him\her in which group was chosen for) and signed the consent of acceptance.

Then, the patient was assessed by the following:

- Weight was measured as following: The patient had to remove shoes, outer clothing such as jackets and sweaters, heavy jewelry, and contents of pockets, such as loose change, mobile phones and keys, then stands in the center of the scales with arms hanging loosely by his\her sides. Head had to face forward with looking forward. Once the patient was correctly

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positioned, the observer waited for the scales to stabilize before recording the result to the nearest 0.1kg, (Stevens, *et al*., 2005).

- Height was measured as the following: Assessment of height was conducted by direct measurement of the length from the bottom of the feet to the highest point of the head, (Cheng, *et al*., 2001).
- Calculating BMI: The BMI was calculated as the square root of the difference between the measured body weight (kg) and the measured height (m), (Cheng, *et al*., 2001). Formula: weight (kg) / [height (m)]^2
- Pain assessment: By using a visual analogue scale, intensity of pain was assessed during walking. The patient marked on the line the point that they feel represents their perception of their current state. The VAS score was determined by measuring in millimeters from the left-hand end of the line to the point that the patient marks, (Gould, *et al*., 2001).
- Daily living activities questionnaire was applied to the patient to assess the disabilities developed from knee osteoarthritis, and how these disabilities were affecting the patient's quality of life, (Stamm, *et al*., 2016).

Treatment procedure: The patients were classified randomly by using a coin toss technique into two equal groups:

Group A (study group): the patients were received: 12 physiotherapy sessions, each session contained electrical stimulation (20 minutes), ultrasonic (5 minutes), and ice pack (5 minutes) on the affected area. Strengthening exercises in the form of static knee contraction and straight leg

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raising exercises using free weights were applied within the physical therapy sessions only when the patient's complaint of pain started to subside gradually.

The patients had been given jars of the topical ointment containing the selected mixture of herbal oils (marked with symbol A) and were instructed to rub the affected area, with the ointment twice daily (morning and evening).

Group B (control group or shame group): The patients were received the same treatment as group A, except they were given placebo ointment jars (marked with symbol B).

Re-assessment procedure:

- Pain intensity was re-assessed by VAS during walking.
- Daily living activities questionnaire was re-applied to the patient to re-assess the impact of the experiment on the disabilities developed from knee osteoarthritis, and to explore any change happened in the patient's quality of life.

RESULTS

Demographic data of the patients in groups (study and control): The patients participated in this study were classified into two groups of equal number.

Study group: included 40 patients of age with $\overline{X}$ ± SD value was (55.55 ± 2.57) (table 5), weight with $\overline{X}$ ± SD value was (98.63 ± 7.56) (table 5) and

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height with $\overline{X}$ ± SD value was (163.93 ± 0.04) (table 5). The sex distribution in the study group revealed that there were 21 (52.5%) females and 19 (47.5%) males, (table 5).

Control group: included 40 patients of age with $\overline{X}$ ± SD value was (55.05 ± 2.73) (table 5), weight with $\overline{X}$ ± SD value was (100.68 ± 8.36) (table 5) and height with $\overline{X}$ ± SD value was (166.08 ± 0.06) (table 5). The sex distribution in the control group revealed that there were 20 (50%) females and 20 (50%) males (table 5).

Table (5): The mean values of the age (years), weight (kg), height (cm) and sex distribution in groups (study and control)

Variable	Groups		$\overline{X}$ ± SD	t-value	p-value
Age (years)	Study group		55.55 ± 2.57	0.84	0.401 NS
	Control group		55.05 ± 2.73		
Weight (kg)	Study group		98.63 ± 7.56	1.15	0.253 NS
	Control group		100.68 ± 8.36		
Height (cm)	Study group		163.93 ± 0.04	1.86	0.067 NS
	Control group		166.08 ± 0.06		
Sex	Study group	Females	21 (52.5%)	χ^2 value 0.05	0.823 NS
		Males	19 (47.5)		
	Control group	Females	20 (50%)		
		Males	20 (50%)		

$\overline{X}$: Mean. SD: Standard Deviation. NS: Non-Significant.

Measured variables included:

Dynamic knee pain during walking:

(a) Comparison of mean values of dynamic knee pain during walking

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between study and control groups (Pre and post-treatment):

The results of the study group revealed that, pre-treatment $\overline{X}$ ± SD value was 6.3 ± 1.11, while that of post-treatment was 1.98 ± 1.05. According to the paired t-test; a significant difference (p= 0.0001) was revealed when comparing between pre and post-treatment mean values (MD= 4.32) (table 6) and percent of change = 68.57%.

The results of the control group revealed that, pre-treatment $\overline{X}$ ± SD value was 5.95 ± 1.93, while that of post-treatment was 4.88 ± 1.24. According to the paired t-test; a significant difference (p= 0.0001) was revealed when comparing between pre and post-treatment mean values (table 6) and percent of change = 17.98%.

Table (6): Comparison of mean values of dynamic knee pain during walking between study and control groups (Pre and post-treatment)

Dynamic knee pain during walking	**Study group**		**Control group**	
	Pre-Treatment	**Post-Treatment**	**Pre-Treatment**	**Post-Treatment**
$\overline{X}$ ± SD	6.3 ± 1.11	1.98 ± 1.05	5.95 ± 1.93	4.88 ± 1.24
MD	4.32		1.07	
% of change	68.57 %		17.98 %	
t-test	35.79		4.91	
p-value	0.0001		0.0001	
Level of Significant	S		S	

$\overline{X}$: Mean. SD: Standard Deviation. NS: Non-Significant.

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(b) Comparison of the mean values of dynamic knee pain during walking pre and post-treatment in the two groups (study and control):

According to the t-test (table 7), when comparing the two groups (study and control) before treatment, the $\overline{X}$ ± SD values were 6.3 ± 1.11 and 5.95 ± 1.93 respectively with no significant difference (p= 0.325), while comparing the two groups after four weeks of treatment, the $\overline{X}$ ± SD values were 1.98 ± 1.05 and 4.88 ± 1.24 respectively with a significant difference (p= 0.0001) in favor of the study group and percent of change was 59.42 %.

Table (7): Comparison of the mean values of dynamic knee pain during walking pre and post-treatment in the two groups (study and control)

Two Groups	Dynamic knee pain during walking			
	Pre-treatment		Post-treatment	
	Study group	Control group	Study group	Control group
$\overline{X}$ ± SD	6.3 ± 1.11	5.95 ± 1.93	1.98 ± 1.05	4.88 ± 1.24
MD	0.35		2.9	
% of change	–		59.42 %	
t-test	0.99		11.26	
p-value	0.325		0.0001	
Level of Significant	NS		S	

$\overline{X}$: Mean. SD: Standard Deviation. NS: Non-Significant.

Functional mobility

(a) Comparison of mean values of functional mobility between study and control groups (Pre and post-treatment):

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The results of the study group revealed that, pre-treatment $\overline{X}$ ± SD value was 1.13 ± 0.33, while that of post- treatment was 1.8 ± 0.4. According to the paired t-test; a significant difference (p= 0.0001) was revealed when comparing between pre and post-treatment mean values (table 8) and percent of change = 59.29%.

The results of control group revealed that, pre-treatment $\overline{X}$ ± SD value was 1.18 ± 0.38, while that of post-treatment was 1.45 ± 0.5. According to the paired t-test; a significant difference (p= 0.01) was revealed when comparing between pre and post-treatment mean values (table 8) and percent of change = 22.88%.

Table (8): Comparison of mean values of functional mobility between study and control groups (Pre and post-treatment)

Functional mobility	**Study group**		**Control group**	
	Pre-Treatment	**Post-Treatment**	**Pre-treatment**	**Post-treatment**
$\overline{X}$ ± SD	1.13 ± 0.33	1.8 ± 0.4	1.18 ± 0.38	1.45 ± 0.5
MD	0.67		0.27	
% of change	59.29 %		22.88 %	
t-value	8.12		2.72	
p-value	0.0001		0.01	
Level of Significant	S		S	

$\overline{X}$: Mean. SD: Standard Deviation. NS: Non-Significant.

(b) Comparison of mean values of functional mobility pre and post-treatment in the two groups (study and control):

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According to the t-test (table 9), when comparing the two groups (study and control) before treatment, the $\overline{X}$ ± SD values were 1.13 ± 0.33 and 1.18 ± 0.38 respectively with no significant difference (p= 0.537), while comparing the two groups after four weeks of treatment, the $\overline{X}$ ± SD values were 1.8 ± 0.4 and 1.45 ± 0.5 respectively with a significant difference (p= 0.001) in favor of study group and percent of change was 19.44%.

Table (9): Comparison of mean values of functional mobility pre and post-treatment in the two groups (study and control)

Two Groups	**Functional mobility**			
	Pre-treatment		**Post-treatment**	
	Study group	**Control group**	**Study group**	**Control group**
$\overline{X}$ ± SD	1.13 ± 0.33	1.18 ± 0.38	1.8 ± 0.4	1.45 ± 0.5
MD	0.05		0.35	
% of change	–		19.44 %	
t-test	0.62		3.42	
p-value	0.537		0.001	
Level of Significant	NS		S	

$\overline{X}$: Mean. SD: Standard Deviation. NS: Non-Significant.

DISCUSSION

One of the major causes of disability throughout the world is arthritis. The pathophysiology phenomenon of arthritis involves dysregulation of pro-inflammatory cytokines and pro-inflammatory enzymes, which results in elevated levels of prostaglandins, leukotriene, and nitric oxide, in addition to

the presence of adhesion molecules, matrix metalloproteinase, and hyper proliferation of synovial fibroblasts. Thus, agents that can suppress either one or multiple of these factors could serve as a potential treatment of arthritis, (Patel, *et al*. 2013).

The selected oil mixture was enrolled in ointment base to be more accepted by the patient and to be easier to use, controversy the use of oil base which may be unacceptable for many patients due to the nature of oil base that hard to clean the remaining (unabsorbed) part and the hard cleaning of the clothes if get oil patches.

The demographic data shows that there wasn't a significant difference in age, sex, weight, or height between the study and control groups.

The results obtained from the research showed a significant decreasing of the dynamic knee pain during walking and a significant increasing of the functional mobility in the study group before and after treatment however we noticed that the variables improved in the control group significantly as well due to the effect of physical therapy program which provided local pain modulation and anti-inflammatory but, although the patients in the control group received the physical therapy program in addition to the suitable medication, the improvement was less significant than the improvement occurred – after treatment – in the patients of study group who had the additional advantage of using the selected herbal extracts (ointment mixture),

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which indicated that the ointment mixture has a therapeutic effect and improves the dynamic knee pain during walking and the functional mobility.

Explanation of the obtained results:

1- Decrease joint pain and inflammation: The selected herbal ointment significantly improved the osteoarthritic pain during motion for the study group that is because of the following reasons:

- The excitatory effect of camphor extract on thermosensitive (and nociceptive) cutaneous fibers because camphor is a known agonist of Transient Receptor Potential Vanilloid subtype 2 (TRPV2), Transient Receptor Potential Ankyrin 1 (TRPA1) as well as Transient Receptor Potential Vanilloid subtype 1 (TRPV1) quickly deactivating Transient Receptor Potential (TRP) channels resulting in long-term pain relief, (Xu, *et al*., 2005).
- The existence of calcium antagonism in peppermint oil helps in removing the pain due to its wonderful cooling properties, (Shrivastava, 2009).
- Black seeds and garden cress extracts contributes to the anti-inflammatory effect of the selected mixed herbal cream through the presence of flavonoids, alkaloids, cyanogenic glycosides (traces), tannins, glucosinolates, sterols and triterpens in their compounds, (Alemi, *et al*. 2013 and Shrivastava, 2009).

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- Ginger extract adds very important value to the previous extracts, ginger extract facilitates skin absorption due to its thermal effect, (Therkleson, 2012).

2- Decrease joint stiffness and physical disability because it can positively affect the rehabilitation program due to facilitating the performance of the exercise without pain. Exercise strengthens the muscles around the joints to protect the joints and provide the required support leading to decrease pressure on joints and improve overall health.

Camphor (Camphora officinarum Baub.) has long been prescribed in traditional medicine for the treatment of inflammatory diseases such as musculoskeletal pains, rheumatic condition, sprains, and bronchitis. C. officinarum has anti‑inflammatory mechanisms blocked the production of Interleukin (IL)-1 beta, IL-6 and the Tumor Necrosis Factor (TNF)-alpha from RAW264.7 cells stimulated by LipoPolySaccharide (LPS) up to 20-70%. The hexane and EtOAc extracts (100 microg/ml) also inhibited Nitric Oxide (NO) production in LPS/InterFeroN (IFN)-gamma-activated macrophages by 65%, (Lee, *et al*. 2006).

The present study is in agreement with George, (2011) who conducted a study to assess the effectiveness of camphor oil on joint pain among elderly in a selected old age home. 30 samples were selected by Quasi Experimental Research Design (One group pre-test – post-test design), the level of joint pain assessed by visual analogue scale. The result revealed that statistically

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significant reduction in the level of pain following topical application of camphor oil among elderly.

This study is in agreement with Topp, *et al*. (2013), who conducted a study on the effect of either topical camphor or a placebo on functioning and knee pain among patients with Knee OA. The sample size was 20 individuals with knee OA. The data collected by the performance of functional tasks and self-reporting knee pain by using Visual Analogue Scale. The result revealed that the camphor intervention resulted in significant reductions in pain during the tasks. The placebo condition did not result in any significant changes in pain during the functional tasks. There were no differences detected in functional tasks or pain following the placebo and camphor conditions. It concluded that the findings provide partial support regarding the efficacy of camphor oil to improve functioning and reduce pain among knee OA patients.

External usage of peppermint oil gives relief from pain. The existence of calcium antagonism in peppermint oil helps in removing the pain due to the wonderful cooling properties, (Shrivastava, 2009).

This study is in agreement with Hossain, *et al*. (2020), they studied formulation and development of a topical combination cream for arthritis managements to enhance the healing of arthritis patients within a short period of time, they stated that "A single use of glucosamine or chondroitin is not effective against arthritis. However, the combination with camphor and peppermint oil enhances pain relief, with quick onset of action"

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This study is in agreement with Tosun, *et al*, (2011) whose study showed that in patients with knee OA, self-massage with ginger oil in addition to standard treatment had better outcomes in terms of pain alleviation and promotion of functional state. Massage with ginger oil may be used as a complementary method to standard medical treatment.

This study is in agreement with Kravchenko, *et al*. (2019) as they measured the anti-inflammatory and analgesic activity of ointment based on dense ginger extract. They concluded that dense ginger extract was revealed to possess significant antinociceptive and anti-inflammatory actions after its transdermal delivery.

In a cohort study involving 56 patients with rheumatic disorders, more than 75% experienced relief of pain and swelling after an average dosage of 3 gm raw ginger per day for periods varying between 3 months and 2 years, (Srivastava, and Mustafa, 1992).

A randomized clinical trial included 67 patients, of whom 56 were able to be evaluated. This was a 3-way, crossover study comparing ibuprofen, ginger extract, and placebo. The ranking of efficacy was ibuprofen. ginger extract. placebo for VAS scores on pain and the Lequesne index, but no significant difference was seen when comparing ginger extract and placebo directly. Exploratory testing of the first period of treatment (before crossover) was performed and this showed a better effect of both ibuprofen and ginger

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extract compared with that of placebo (Bliddal, *et al*., 2000) which supports the results of this thesis.

This study is in agreement with the study of Huseini, *et al*. (2016) who showed that as compared with the topical administration of diclofenac, topical administration of black seed oil had significant therapeutic effects on patients with cyclic mastalgia without any adverse effects. In which, 600 mg of NS oil (in the first treatment group) and 20 mg of topical diclofenac (in the second treatment group) were applied to the painful area twice daily for two months.

Lepidium seed powder was studied in 98 patients of osteoarthritis (Raval, and Pandya, 2009). In which study, 30% patients got complete remission, 37.5% patients got marked improvement, 25% patients were moderately improved, and 7.5% patients were not improved. The results were encouraging and supporting the results of current study that Lepidium sativum is effective in alleviating the symptoms of osteoarthritis.

This study recommends continuous use of the suggested mixture twice time daily (morning and evening) will improve symptoms of osteoarthritis, reduce physical disability, and improve the patient's health-related quality of life.

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الدور المحتمل لاستخدام خليط من مستخلصات الاعشاب الطبيعية المختارة المستخدمة بيئياً للتعامل مع العجز البدني

مصطفى أحمد بدر أبو شقة[١]– مصطفى حسن رجب[٢]– محمد صلاح الدين مصطفى[٣]
ميرفت عبد الرحمن محمد[٤]– أيمن محمود أحمد حمودة[٥]– جورج منير أطناس ميخائيل[٦]
نادية فؤاد محمد دياب[٧]

١) المعهد القومي للقلب ٢) كلية الدراسات العليا والبحوث البيئية، جامعة عين شمس ٣) كلية الدراسات العليا للطفولة، جامعة عين شمس ٤) كلية العلاج الطبيعي، جامعة سفنكس ٥) معهد بحوث البساتين ٦) كلية الصيدلة، جامعة عين شمس ٧) مستشفى جلوبال كير

المستخلص

الخلفية والغرض: الإصابة بالخشونة هي المسئولة عن معظم عمليات استبدال مفصل الركبة وفقدان الفعالية في العمل وهي السبب الأكثر شيوعًا لألم العضلات والعظام عند البالغين. أجريت هذه الدراسة لمعرفة دور استخدام خليط مستخلصات الاعشاب الطبيعية المختارة بيئياً في التعامل مع العجز البدني

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الناتجة عن التهاب مفاصل الركبة الأولي. كانت مستخلصات الأعشاب المختارة عبارة عن المستخلصات الزيتية للكافور والنعناع والزنجبيل والقرنفل وحبة البركة وحب الرشاد في قاعدة مرهم.
الموضوعات والطريقة: تم إجراء البحث على ثمانين مريضًا من العيادة الخارجية في المعهد القومي للقلب وتم تسجيلهم في هذه الدراسة. كانوا يعانون من خشونة في الركبة من الدرجة (ج) ولديهم عجز في أنشطة الحياة اليومية بسبب خشونة في الركبة. تم تقسيمهم عشوائياً إلى مجموعتين متساويتين: مجموعة الدراسة، تلقى المرضى برنامج علاج طبيعي لمدة ١٢ جلسة، بالإضافة إلى استخدام مرهم يحتوي على خليط منتقى من زيوت الاعشاب، وتم توجيههم لدهن المنطقة المصابة بأنفسهم باستخدام المرهم مرتين يومياً، وتلقى المجموعة الضابطة مثل مجموعة الدراسة ما عدا أن المرهم كان بدون إضافات. تم تقييم آلام الركبة الديناميكية أثناء المشي والحركة الوظيفية.
النتائج: أظهر التحليل الإحصائي تحسناً ملحوظاً ($p = 0.001$) في آلام الركبة الديناميكية أثناء المشي في مجموعة الدراسة مقارنة بالمجموعة الضابطة. أظهر الحركة الوظيفية فرقًا كبيرًا ($P = 0.001$) لصالح مجموعة الدراسة أيضًا.
الخلاصة: إن استخدام مثل هذا المزيج من مستخلصات الاعشاب مع برنامج العلاج الطبيعي المنتظم يمكن أن يقلل من آلام مفصل الركبة أثناء المشي، مما يسمح بمزيد من الحركة الوظيفية للمرضى الذين يعانون من خشونة الركبة من الدرجة (ج)، مما يساعد في تقليل العجز البدني وتحسين جودة حياتهم المرتبطة بالصحة.