

Effect of Wax Therapy On Modulating Pain in Subjects with Mild to Moderate Osteoarthritis of Knee Joint

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1. Introduction

As a matter of fact, age is the most prominent risk factor for initiation and progression of osteoarthritis. The common explanation for this is the cumulative effect of mechanical load over the years, resulting clinically in “wear and tear” and pathologically in cartilage breakdown ⁽¹⁸⁾

Aging also has profound effects on cellular processes notably leading to enhanced apoptosis and reduced cellular regeneration. ⁽²⁰⁾

On a molecular level, aging research has revealed intrinsic changes in the structure of extracellular matrix proteins such as collagen or proteoglycans. ⁽¹⁹⁾

During the last decade, however, it became clearer that OA is not a purely mechanical problem. Inflammatory and metabolic processes are substantially involved in the pathogenesis and progression of OA. ⁽¹⁸⁾ Stiffening of the collagen network or increased glycation provoke a functional impairment of cartilage and joint function. ⁽¹⁹⁾ Nonenzymatic collagen cross linking leads abnormalities in bone toughness and stiffness. Bone plasticity is further suppressed by an increase of osteon density, which leads to a lower potency of crack bridging mechanics. ⁽²¹⁾

Synovitis is frequently involved in OA, notably in the early phase of the disease. ⁽²²⁾

2. Objectives of The Study

- To assess the pretest and post-test level of knee pain among subjects of both sex of age above 35 years who has osteoarthritis.
- To assess the effectiveness of wax therapy on knee pain among subjects of both the sex of age above 35 years who has osteoarthritis.
- To find out the association between the pretest level of knee pain among subjects of both the sex of age above 35 years who has osteoarthritis.

3. Review of Literature:

Introduction

Knee osteoarthritis (KOA) is the most prevalent progressive osteoarthritis disease with persistent knee pain in the clinic. Its clinical manifestations include persistent paroxysmal pain of the knee joint, proprioceptive disorders, morning stiffness, joint swelling, feeling of bone friction, and limited movement. According to incomplete statistics, in foreign countries, KOA is experienced by 10% of the population. The proportion of female patients is higher than that of male patients, with the prevalence increasing with age [2]. KOA is a heterogeneous disease with various etiologies, pathophysiological pathways, clinical manifestations, and prognoses, causing clinical decompensation, serious disability, and psychological problems in most patients and bringing a great inconvenience to their lives and work.

Definition

Osteoarthritis is a chronic, degenerative disorder of unknown cause characterized by gradual loss of articular cartilage. It is the most prevalent disease in our society, with a worldwide distribution. (1) Osteoarthritis is a degenerative joint disease that involves the degradation of joints, articular cartilage and subchondral bone as a result of mechanical stress on the area. The word Osteoarthritis is derived from Greek word "Osteo" which means of the bone "arthro" which means "joint, inflammation". (5)

Epidemiology:

It has been estimated that 45% of all people develop knee OA at some point during life. Although some are asymptomatic, the lifetime risk of having a total knee replacement for OA in someone aged 50 is about 11% for women and 8% for men in the UK. (1)

There are major differences in susceptibility: the prevalence of knee OA is higher in Africa, China, Japan and South Asia than in European countries. (1)

In England and Wales, between 1.3 and 1.75 million people have symptomatic osteoarthritis. (25)

Data from arthritis research campaign show that up to 550,000 people in the UK have the severe knee osteoarthritis and 2 million people visited their general practitioner in the past year because of osteoarthritis. (25)

As a cause of disability in the elderly in the west, osteoarthritis is second only to cardiovascular diseases. (25)

10-15% of adults over 60 years have some degree of osteoarthritis, with an ageing population it is becoming an increasingly important disease. (25)

- About 15% of people in India suffer from arthritis.
- Prevalence of osteoarthritis accounts for 22%-39%.
- In female -31.6% • In male-28.1%. (5)

Types:

Primary OA: occurs in elderly more commonly in women than men. Due to wear and tear with repeated minor trauma, heredity, obesity, ageing per se.

Secondary OA: may appear at any age and is the result of any previous wear and tear phenomena involving the joint such as previous injury, fracture, inflammation, loose bodies and congenital dislocations. (3)

SIGNS AND SYMPTOMS

- Joint pain with activity
- Reduced range of movement
- Stiffness
- Joint instability
- Bone spur
- Crepitus

ETIOLOGY

There are many risk factors for the development of OA which are as follows.

- Advanced age
- Female sex
- Obesity
- Occupation which involves repetitive loading of particular joints (e.g. shipyard workers)
- Sports activities
- Previous injury to joint
- Muscle weakness
- Proprioceptive deficits
- Genetic factors
- Acromegaly
- Calcium crystal deposition disease

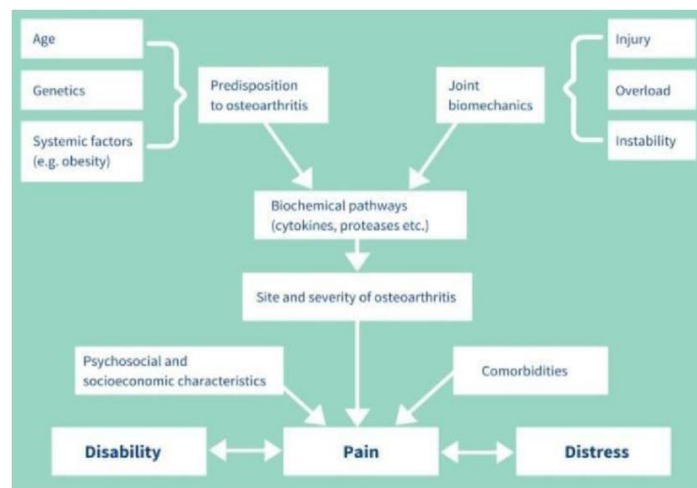


Fig 1.1

ETIOPATHOGENESIS

Osteoarthritis is traditionally thought of as a ‘wear and tear’ disease which occurs as we age. However, recent research suggests otherwise.

The pathogenesis of OA involves degradation of cartilage and remodeling of bone due to an active response of chondrocytes in the articular cartilage and the inflammatory cells in the surrounding tissues. The release of enzymes from these cells breaks down collagen and proteoglycans, destroying the articular cartilage. The exposure of the underlying subchondral bone results in sclerosis, followed by reactive remodelling changes that lead to the formation of osteophytes and bone cysts.

Traditionally, osteoarthritis was viewed as an inevitably progressive, degenerative disease process. New work suggests that it is a dynamic process that may progress episodically. It is a heterogeneous group of diseases characterised by an adaptive response of synovial joints to a variety of environmental, genetic, and biomechanical stresses.

Cartilage is made of water (70%) and a type II collagen framework with proteoglycans and glycosaminoglycans (consisting mainly of aggrecan and also chondroitin), produced by chondrocytes. Proteoglycans in turn bind to hyaluronate which stabilises the macromolecule. Chondrocytes receive nutrition from the synovium by diffusion and the synovial fluid is circulated by joint movement.

The synovium has been shown to be variably inflamed in osteoarthritis producing increased levels of interleukin-1 (IL-1) and tumour necrosis factor-alpha (TNF- α), cytokines that induce nitric oxide and metalloproteinase production. Interleukin-6 (IL-6) and mechanical loading of the joint also induce catabolic cytokine receptors. This bind IL-1 and TNF- α within cartilage causing more destruction. It is thought that the osteophytes and subchondral sclerosis seen in osteoarthritis may be the body’s way of trying to compensate for lack of cartilage.

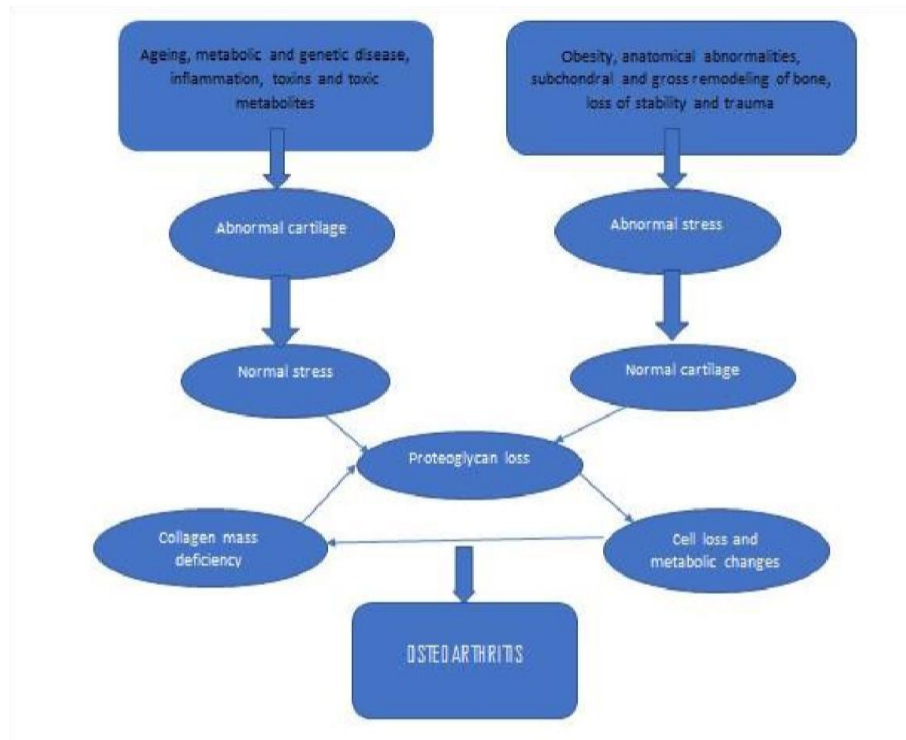
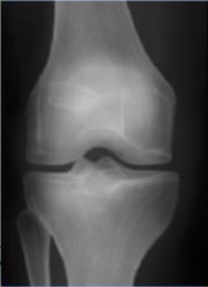
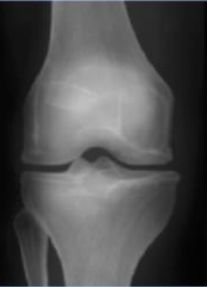
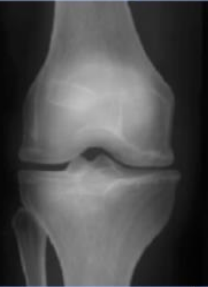
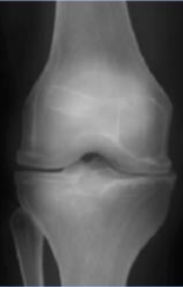


Fig. 1.2

STAGES OF OA OF KNEE

Kellgren-Lawrence Grading Scale					
					
Grade 1	Grade 2	Grade 3	Grade 4		
Classification	Normal	Doubtful	Mild	Moderate	Severe
Description	No Features of OA	Minute Osteophyte: doubtful significance	Definite Osteophyte: normal joint space	Moderate Joint Space Reduction	Joint Space Greatly Reduced: subchondral sclerosis

GENERAL FEATURES

- The main symptoms of OA are pain and restriction of joint movement. Patient is usually above 45 years (often over 60 years).
- Pain is of insidious onset over months or years. Usually one or few joints are affected and weight bearing joints are commonly involved (such as knee and hip). It is variable or intermittent over time ('good days, bad days'). It is worse on movement and weightbearing, and relieved by rest. Morning stiffness is less (<15 minutes) compare to rheumatoid arthritis (>1 hour).
- Examination of the involved joint shows restricted movement (due to capsular thickening and blocking by osteophyte), coarse crepitus on movement (due to rough articular surfaces), bony swelling (osteophyte) around joint margins, joint deformity, and joint-line tenderness.
- Muscle wasting is present around the involved joint.
- Generalized OA involves multiple joints. It initially starts at interphalangeal joints (IPJs) of fingers affecting distal interphalangeal joints (DIP) more than proximal interphalangeal joints (PIP). Affected joints develop posterolateral swellings on each side of the extensor tendon which enlarge and harden to become Heberden's (DIP) and Bouchard's (PIP) nodes.

Diagnosis of Osteoarthritis

- There is no single test for osteoarthritis. Diagnosing the condition may include the following:
- Providing to a doctor a medical history that includes your symptoms, any other medical problems you and your close family members have, and any medications you are taking.
- Having a physical exam to check your general health, reflexes, and problem joints.
- Having images taken of your joint using:
- X-rays, which can show loss of joint space, bone damage, bone remodeling, and bone spurs. Early joint damage does not usually appear on x-rays.
- Magnetic resonance imaging (MRI), which can show damage to soft tissues in and around the joint. Generally, MRI helps health care providers evaluate a joint that is locking or giving out.
- Having blood tests to rule out other causes for symptoms.
- Taking joint fluid samples to look for other causes of joint pain, such as infection or gout.

Investigations

- Blood counts, ESR and CRP are normal.
- Plain X-ray: This shows reduced joint space, marginal osteophytes and joint deformities.
- Synovial fluid analysis: Predominantly viscous with low turbidity; calcium pyrophosphate crystals maybe seen.

DIFFERENTIAL DIAGNOSIS:

- Rheumatoid arthritis
- Gouty arthritis
- Tendinopathy,
- Bursitis,
- Synovial plica syndrome,
- Idiopathic anterior knee pain syndrome,

- Osseous malignancy
- Referred pain

4. MATERIALS AND METHODS:

Source of data:

The subjects participating in the study are the patients who consulted Government Nature cure and yoga medical college & hospital Mysuru OPD for the improvement of their condition. The subjects who are eligible were asked to be a part of the study and contact the investigator for screening. Those identified through the screening process as potentially eligible subjects are scheduled to meet the study coordinator for consenting process and to undergo a baseline medical assessment including a complete medical history and physical examination by the study consultant. The study consultant confers the diagnosis of Osteoarthritis of knee and excludes from the study those individuals with other medical problems that could put the patient at risk.

5. METHOD OF COLLECTION OF DATA:

PRIMARY OUTCOME VARIABLE

Objective measures:

1. Visual pain analog scale
2. Western Ontario McMaster University knee Osteoarthritis scale (WOMAC)
3. Knee Injury and Osteoarthritis Outcome Score (KOOS)

1. Visual analog scale for pain

Visual analog scale is a tool ideal to help a person rate the intensity of certain sensations and feelings, such as pain. The Visual analog scale for pain is a straight line with one end meaning no pain and other end meaning the worst pain imaginable. The pain marks a point on the line that matches the amount of the pain he or she feels 0 indicates no pain and 10 indicating the worst possible pain. Measuring from the left end to the marked point the pain can be quantified.

SCORING INTERPRETATION

SCORE	LEVEL OF PAIN
0	No pain
1-3	Mild pain
4-6	Moderate pain
7-9	Severe pain
10	Worst pain

2. WOMAC SCALE

The WOMAC pain score

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)

Name: _____ Date: _____

Instructions: Please rate the activities in each category according to the following scale of difficulty:
0 = None, 1 = Slight, 2 = Moderate, 3 = Very, 4 = Extremely. Circle one number for each activity:

Pain	1. Walking	0	1	2	3	4
	2. Stair Climbing	0	1	2	3	4
	3. Nocturnal	0	1	2	3	4
	4. Rest	0	1	2	3	4
	5. Weight bearing	0	1	2	3	4

Stiffness	1. Morning stiffness	0	1	2	3	4
	2. Stiffness occurring later in the day	0	1	2	3	4

Physical Function	1. Descending stairs	0	1	2	3	4
	2. Ascending stairs	0	1	2	3	4
	3. Rising from sitting	0	1	2	3	4
	4. Standing	0	1	2	3	4
	5. Bending to floor	0	1	2	3	4
	6. Walking on flat surface	0	1	2	3	4
	7. Getting in / out of car	0	1	2	3	4
	8. Going shopping	0	1	2	3	4
	9. Putting on socks	0	1	2	3	4
	10. Lying in bed	0	1	2	3	4
	11. Taking off socks	0	1	2	3	4
	12. Rising from bed	0	1	2	3	4
	13. Getting in/out of bath	0	1	2	3	4
	14. Sitting	0	1	2	3	4
	15. Getting on/off toilet	0	1	2	3	4
	16. Heavy domestic duties	0	1	2	3	4
	17. Light domestic duties	0	1	2	3	4

Total Score: _____ / 96 = _____ %

Comments / Interpretation (to be completed by therapist only):

Knee Injury and Osteoarthritis Outcome Score (KOOS)

Source: Roos EM, Roos HP, Lohmander LS, Ekdahl C, Beynnon BD. Knee Injury and Osteoarthritis Outcome Score (KOOS)--development of a self-administered outcome measure. *J Orthop Sports Phys Ther*. 1998 Aug;28(2):88-96.

The Knee Injury and Osteoarthritis Outcome Score (KOOS) is a questionnaire designed to assess short and long-term patient-relevant outcomes following knee injury. The KOOS is self-administered and assesses five outcomes: pain, symptoms, activities of daily living, sport and recreation function, and knee-related quality of life. The KOOS meets basic criteria of outcome measures and can be used to evaluate the course of knee injury and treatment outcome. KOOS is patient-administered, the format is user-friendly and it takes about 10 minutes to fill out.

Scoring instructions

The KOOS's five patient-relevant dimensions are scored separately: Pain (nine items); Symptoms (seven items); ADL Function (17 items); Sport and Recreation Function (five items); Quality of Life (four items). A Likert scale is used and all items have five possible answer options scored from 0 (No problems) to 4 (Extreme problems) and each of the five scores is calculated as the sum of the items included.

Interpretation of scores

Scores are transformed to a 0–100 scale, with zero representing extreme knee problems and 100 representing no knee problems as common in orthopaedic scales and generic measures. Scores between 0 and 100 represent the percentage of total possible score achieved.

Knee Injury and Osteoarthritis Outcome Score (KOOS)

Pain

P1 How often is your knee painful?	☐ Never	☐ Monthly	☐ Weekly	☐ Daily	☐ Always
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What degree of pain have you experienced the last week when...?

P2 Twisting/pivoting on your knee	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
P3 Straightening knee fully	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
P4 Bending knee fully	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
P5 Walking on flat surface	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
P6 Going up or down stairs	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
P7 At night while in bed	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
P8 Sitting or lying	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
P9 Standing upright	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme

Symptoms

Sy1 How severe is your knee stiffness after first wakening in the morning?	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
Sy2 How severe is your knee stiffness after sitting, lying, or resting later in the day?	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
Sy3 Do you have swelling in your knee?	☐ Never	☐ Rarely	☐ Sometimes	☐ Often	☐ Always
Sy4 Do you feel grinding, hear clicking or any other type of noise when your knee moves?	☐ Never	☐ Rarely	☐ Sometimes	☐ Often	☐ Always
Sy5 Does your knee catch or hang up when moving?	☐ Never	☐ Rarely	☐ Sometimes	☐ Often	☐ Always
Sy6 Can you straighten your knee fully?	☐ Always	☐ Often	☐ Sometimes	☐ Rarely	☐ Never
Sy7 Can you bend your knee fully?	☐ Always	☐ Often	☐ Sometimes	☐ Rarely	☐ Never

Activities of daily living

What difficulty have you experienced the last week...?

A1 Descending	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A2 Ascending stairs	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A3 Rising from sitting	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A4 Standing	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A5 Bending to floor/picking up an object	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A6 Walking on flat surface	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A7 Getting in/out of car	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A8 Going shopping	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A9 Putting on socks/stockings	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A10 Rising from bed	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A11 Taking off socks/stockings	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A12 Lying in bed (turning over, maintaining knee position)	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A13 Getting in/out of bath	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A14 Sitting	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A15 Getting on/off toilet	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A16 Heavy domestic duties (shovelling, scrubbing floors, etc)	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
A17 Light domestic duties (cooking, dusting, etc)	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme

Sport and recreation function

What difficulty have you experienced the last week...?

Sp1 Squatting	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
Sp2 Running	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
Sp3 Jumping	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
Sp4 Turning/twisting on your injured knee	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
Sp5 Kneeling	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme

1. Blood pressure
2. Pulse rate
3. Respiratory rate

6. ASSESSMENT DURING STUDY PERIOD:

After recruiting, data of the subjects will be recorded pre and post interventions (for 10 days) by objective measures.

7. SELECTION CRITERIA:

7.1 Inclusion criteria:

- Above 35 below 60 years
- Osteoarthritis of knee
- Both male and female patients

7.2 Exclusion criteria:

- Age above 60 years
- Recent surgery
- Cancer
- Contagious skin disease
- Congenital anomalies
- Auto immune diseases
- Quadriplegia
- Paraplegia
- Sexually transmitted diseases
- Stent implantation
- ICD
- Cardiac disorders

8. STUDY DESIGN:

A pilot study of 10 subjects are selected to undergo wax therapy for 10 days, if they satisfy the selection criteria and consent to participate in the study,

Duration of intervention: 10 days

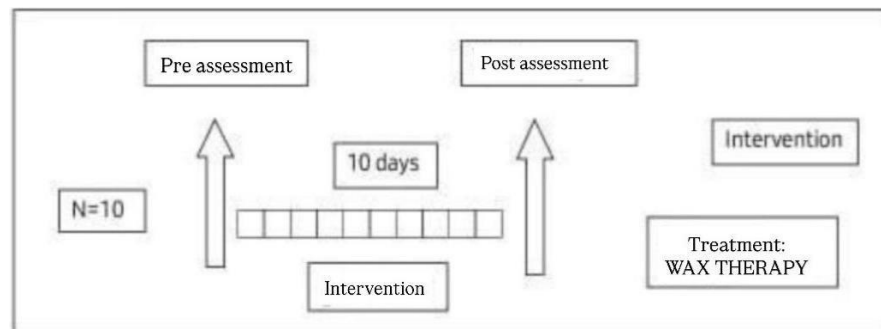
Sampling method: simple random sampling based on inclusion criteria

Sample size: 10

9. STUDY PLAN:

9.1 Subjects:

10 patients who are attending Government Nature cure and yoga medical hospital, Mysore OPD with diagnosis of Osteo arthritis of knee satisfying the selection criteria will be recruited for the study after they have been given informed consent to participate the in the study.



9.2 Study duration: 10 Days

9.3 Intervention:

Group (N=10) will receive wax therapy for the duration of 10 - 15 minutes for 10 days along with the conventional medicine (if any) which will be tapered according to the condition of the subject. Comparison of Preintervention and Post-intervention values of visual pain analog scale, WOMAC scale and KOOS are made which determines the efficacy of wax therapy in the treatment of OA of knee joint.

Procedure of intervention:

Wax Therapy – Dip and Wrap Method (Glove Method)

1. Preparation of Apparatus

- Melt paraffin wax in a wax bath.
- Maintain wax bath temperature at 40–44°C (melting point of wax: 50–52°C).
- Ensure the wax is mixed with mineral oil (about 6:1 ratio) to lower melting point and avoid burns.

2. Preparation of Patient

- Explain the procedure and gain consent.
- Inspect skin for cuts, infections, or contraindications.
- Wash and dry the part thoroughly.
- Remove any jewellery or clothing from the area to be treated.

3. Method of Application (Dip and Wrap)

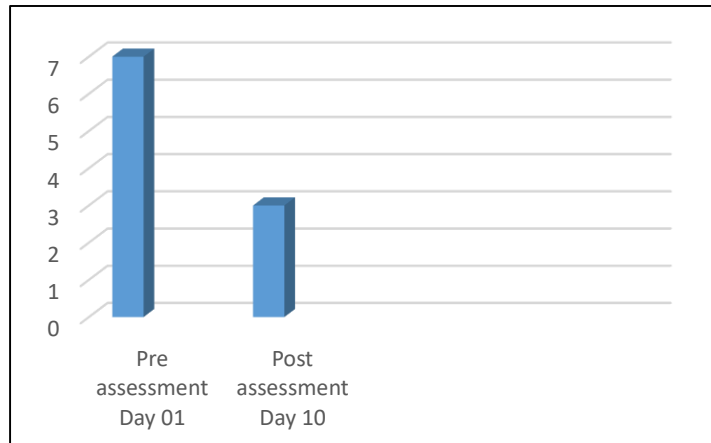
- Patient sits comfortably with the part (commonly hand/foot) positioned near the wax bath.
- The part is slowly dipped into the molten wax and withdrawn immediately.
- Allow a thin wax layer to solidify.
- Repeat dipping 6–12 times to form a thick wax glove.

- After final dipping, wrap the part with plastic sheet and then cover with a towel or blanket to conserve heat.
- Leave in place for 15–20 minutes.

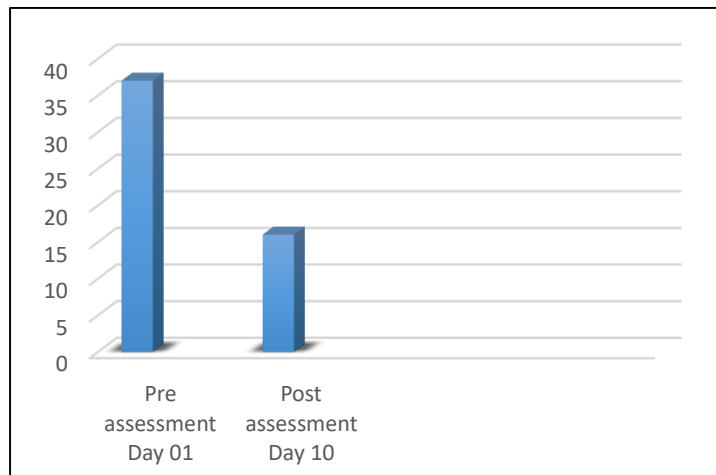
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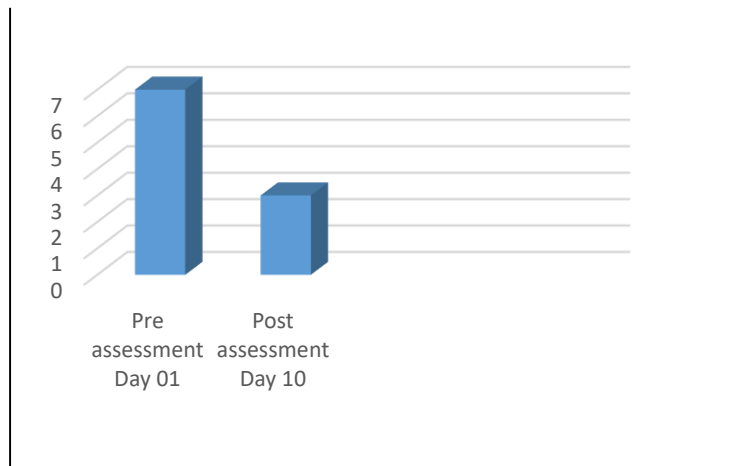
Graphical representation of data of individual subjects;

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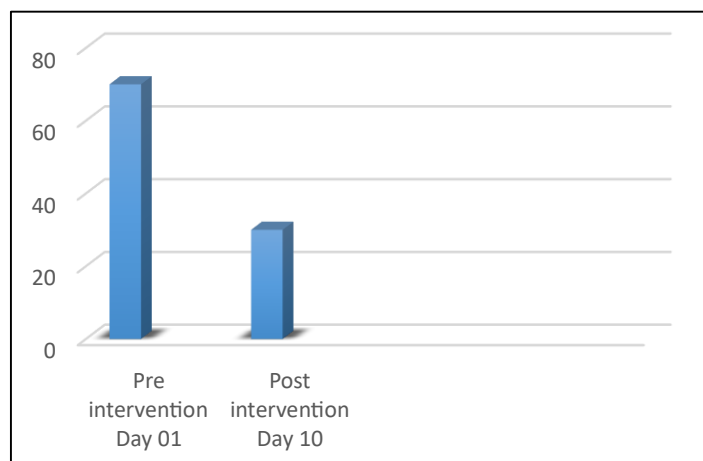


VISUAL PAIN ANALOG SCALE

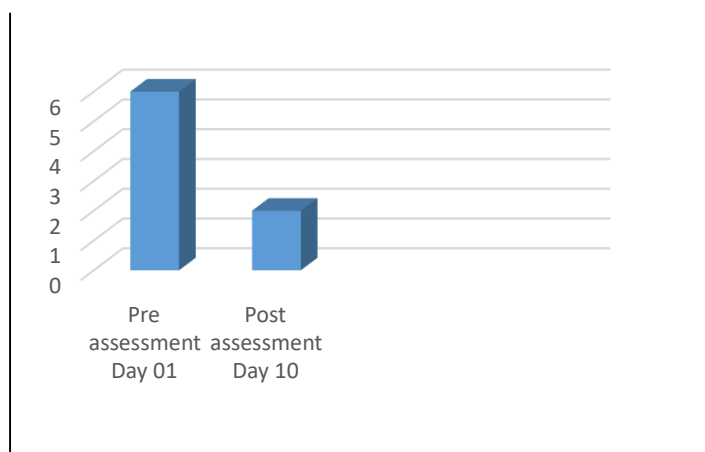


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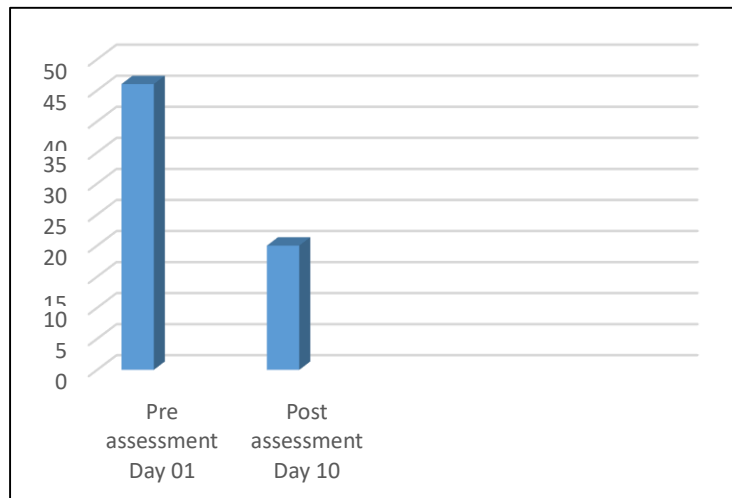
Visual pain analog scale



Visual pain analogue scale

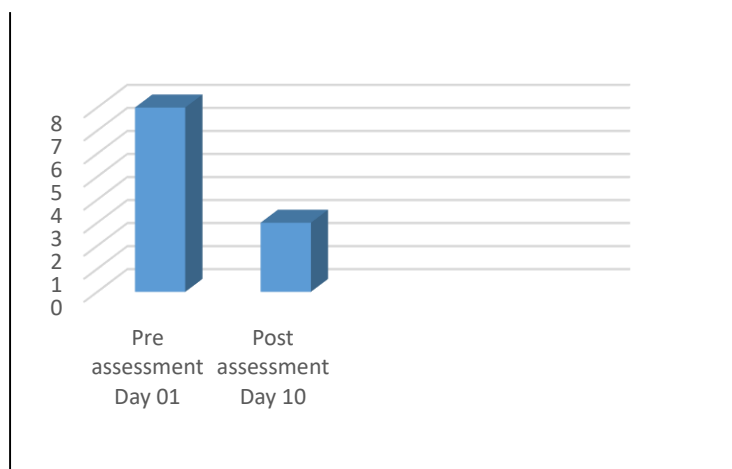
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VISUAL PAIN ANALOG SCALE

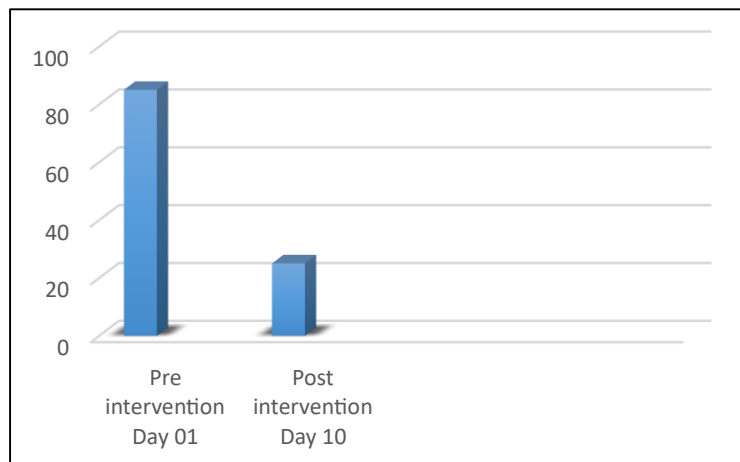


Visual pain analogue scale

SUBJECT 04

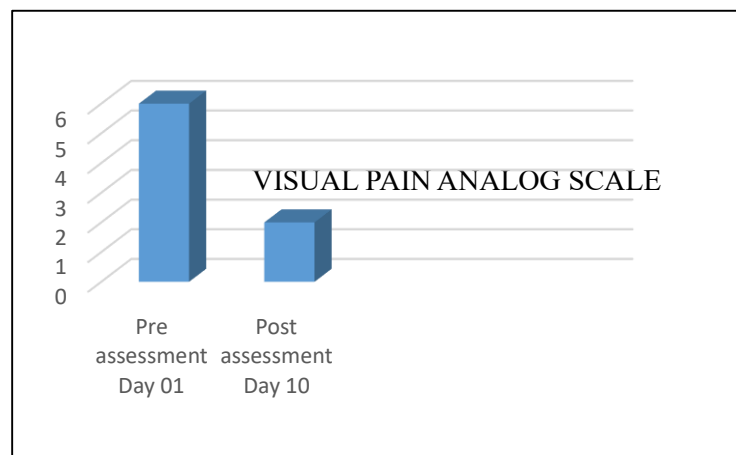


VISUAL PAIN ANALOG SCALE

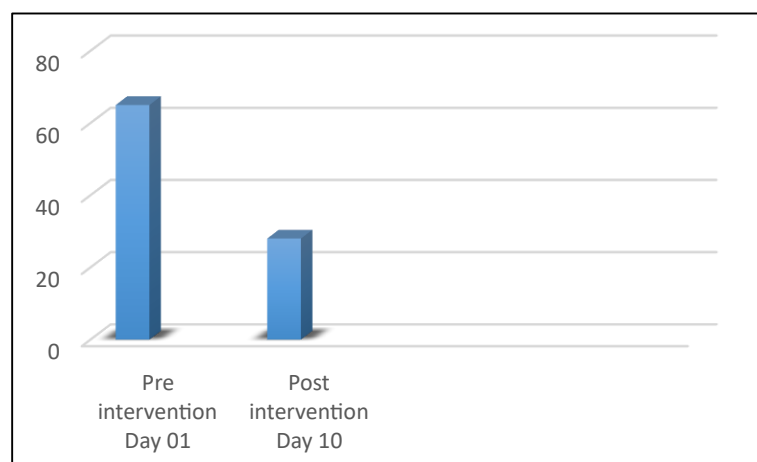


WOMAC SCALE

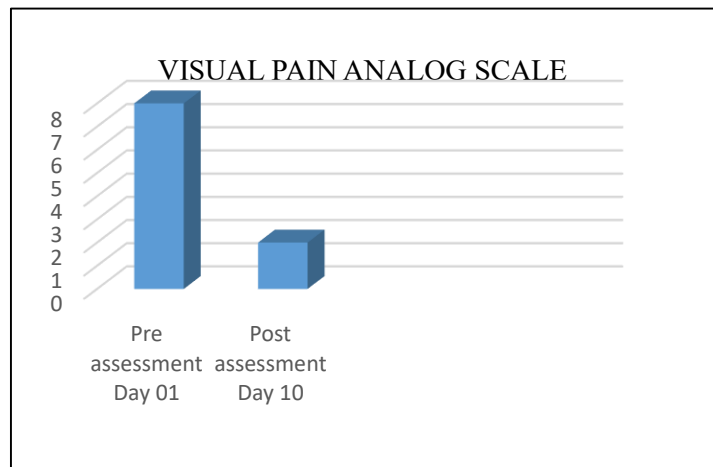
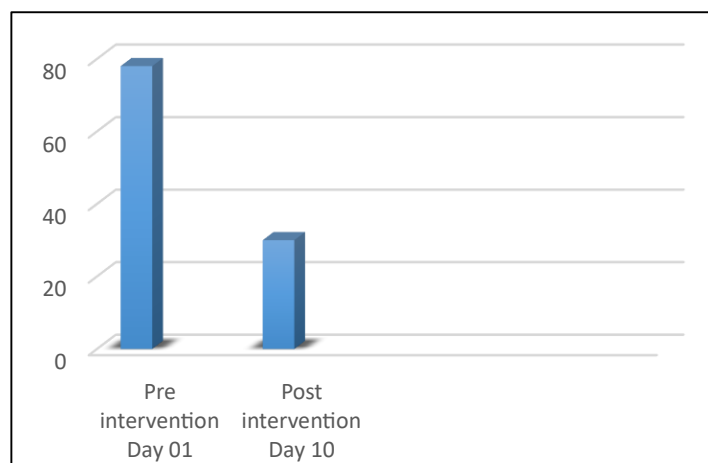
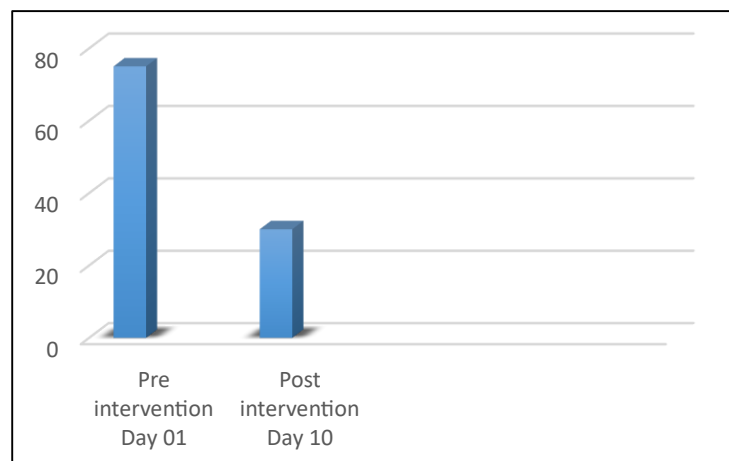
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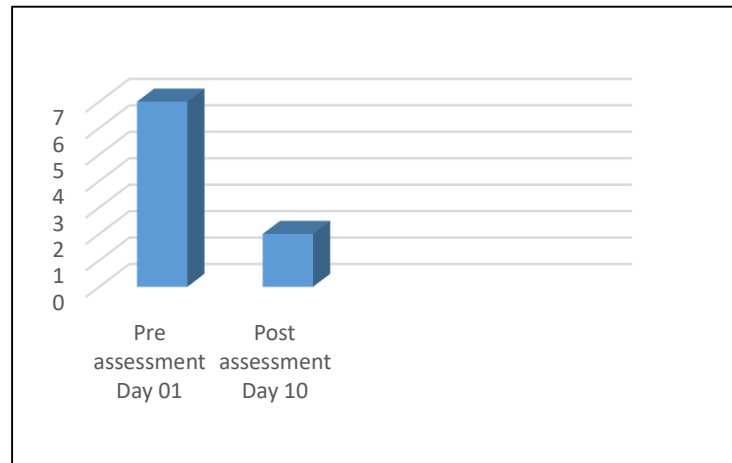


VISUAL PAIN ANALOG SCALE



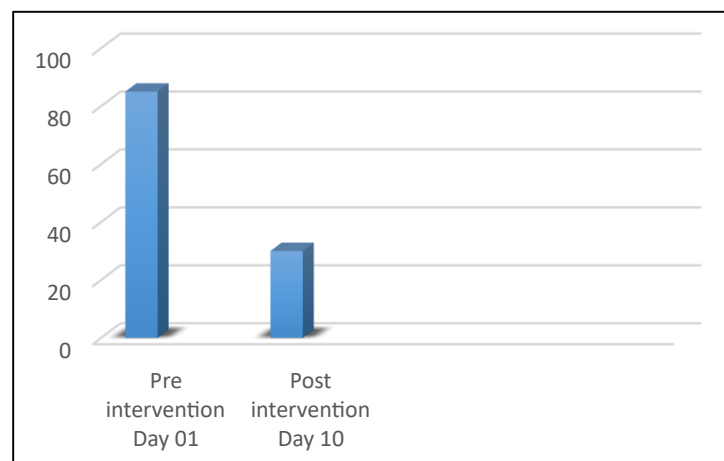
WOMAC SCALE

SUBJECT 06**VISUAL PAIN ANALOG SCALE****SUBJECT 07****VISUAL PAIN ANALOG SCALE**

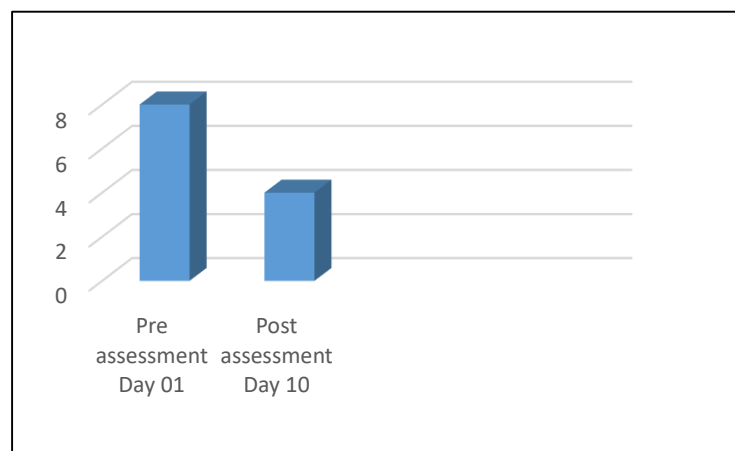


VISUAL PAIN ANALOG SCALE

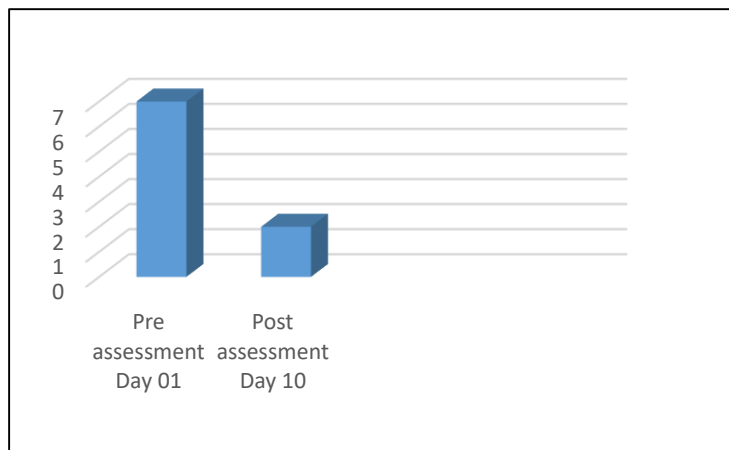
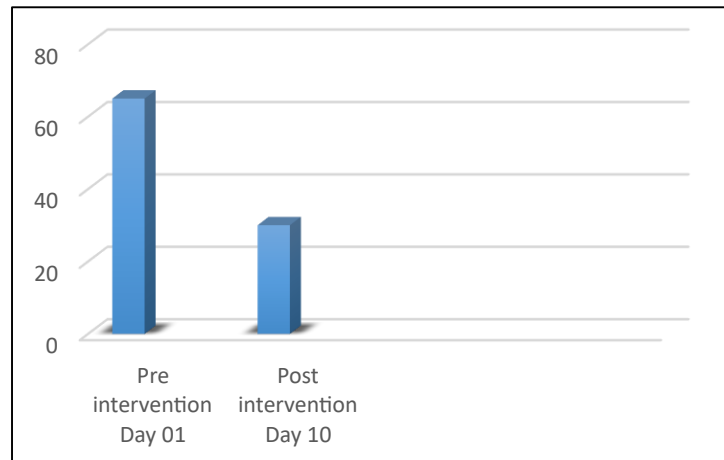
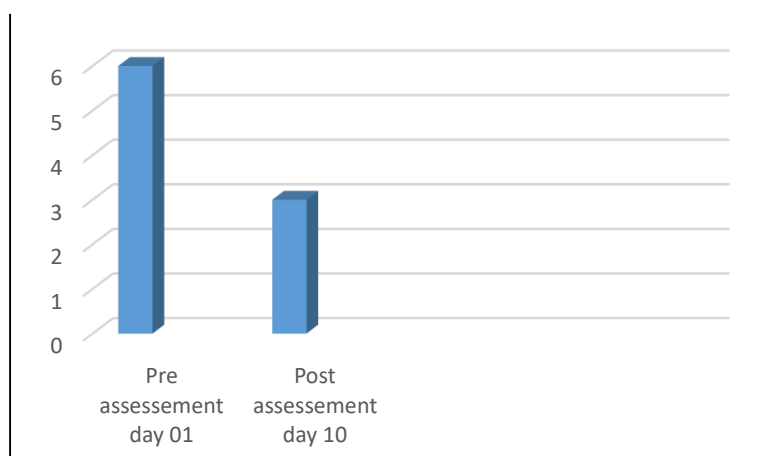
SUBJECT 08

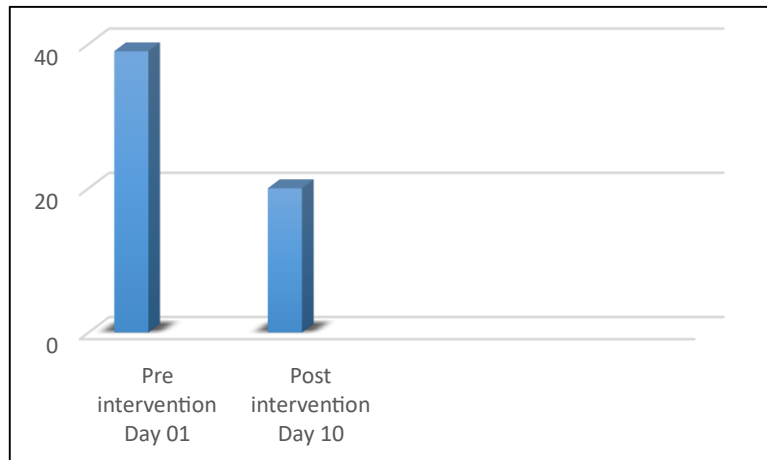


VISUAL PAIN ANALOG SCALE



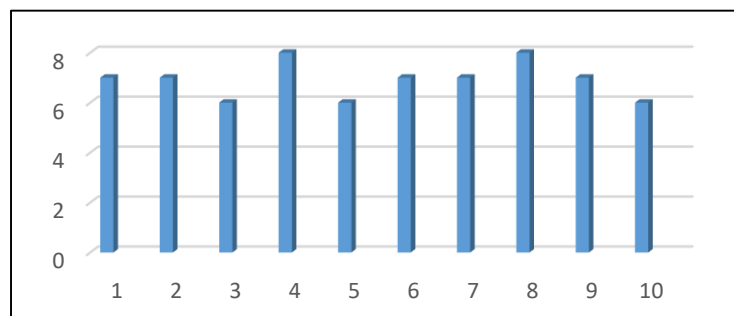
VISUAL PAIN ANALOG SCALE

SUBJECT 09**VISUAL PAIN ANALOG SCALE****SUBJECT 10****VISUAL PAIN ANALOGUE SCALE**

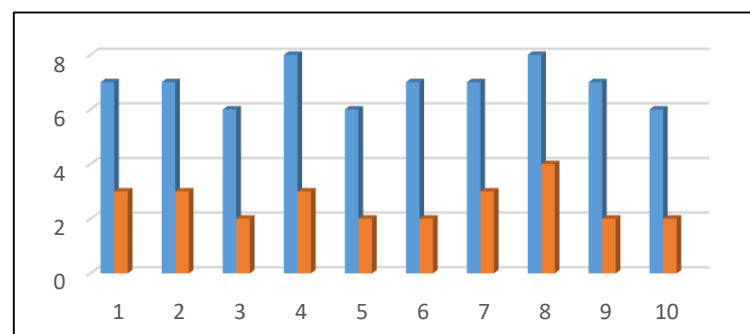
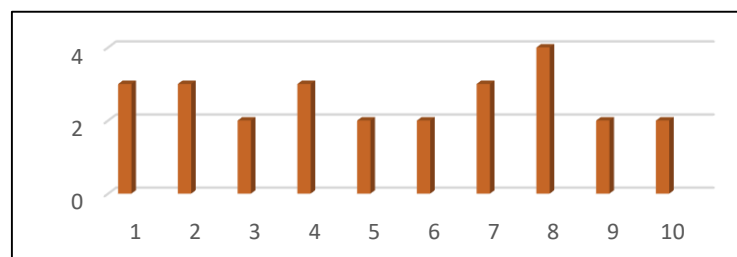


DATA OF ALL SUBJECTS:

Visual pain analog scale of 10 subjects Day-1 pre intervention



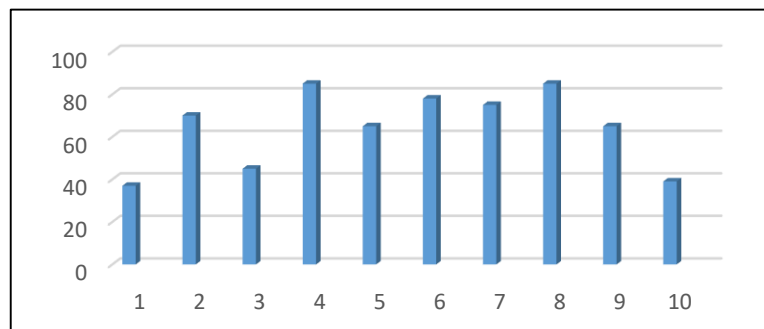
Visual pain analog scale of 10 subjects Day-10 post assessment



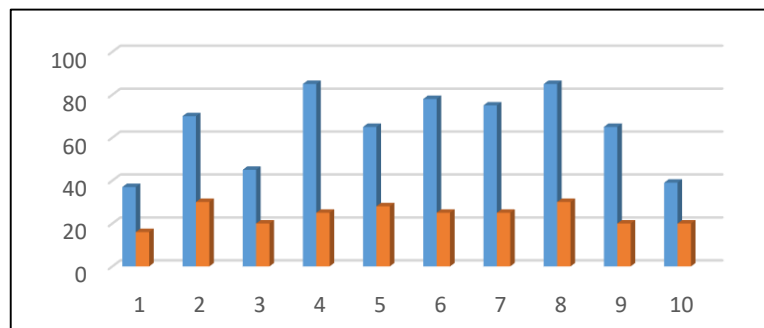
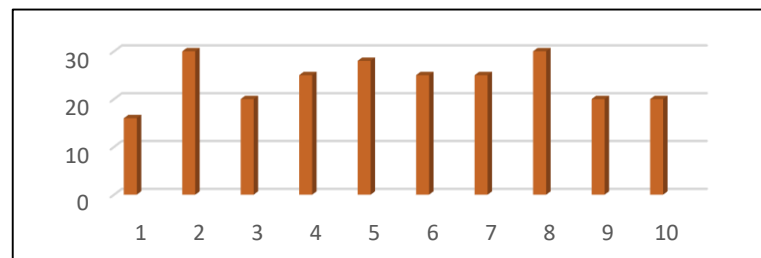
Subjects 1-10

DATA OF ALL SUBJECTS:

WOMAC score of 10 subjects Day-1 pre assessment



WOMAC score of 10 subjects Day-10 post assessment



Subjects 1-10

Observation:

In the present study, 10 participants were registered who underwent the intervention for 10 days. Among these 10 subjects,

Gender wise distribution:

- Male subjects-2
- Female subjects-8

All the subjects were informed about the present study and the written consent was obtained for the same prior to the intervention.

11. Results:

This report presents the results of paired t-tests conducted to evaluate changes in pain and functional disability (WOMAC) scores before and after an intervention. The analysis involved 10 participants, with measurements taken pre- and post-intervention. Both paired t-tests showed statistically significant improvements post-intervention ($p < 0.001$).

This statistical analysis assesses the effectiveness of an intervention by comparing pre-and post-intervention scores for pain and functional disability (WOMAC). Paired t-tests were used to determine whether the intervention led to significant changes in these continuous variables, with a significance level of $\alpha = 0.05$.

The study included 10 participants, with data collected at two time points: before (pre) and after (post) the intervention. The following variables were analyzed using paired t-tests:

- Pain scores ($PAIN_{PRE}, PAIN_{POST}$) WOMAC scores for functional disability ($WOMAC_{PRE}, WOMAC_{POST}$)
- Each paired t-test compared the mean differences between pre-and post-intervention scores.

The paired t-tests revealed significant reductions in both pain and WOMAC scores post-intervention. The detailed results are presented in the tables below.

Table 1: Paired Samples Statistics and Test for Pain Scores

	Mean	N	Std. Deviation	Std. Error Mean
Paired Samples Statistics				
$PAIN_{PRE}$	6.9000	10	0.7379	0.2333
$PAIN_{POST}$	2.4000	10	0.6992	0.2211
Paired Samples Test				df
	Mean	Std. Deviation	t	
Sig. (2-tailed)	4.5000	1.0801	13.175	9
$PAIN_{PRE}$ – $PAIN_{POST}$				
0.000				

Table 2: Paired Samples Statistics and Test for WOMAC Scores

	Mean	N	Std. Deviation	Std. Error Mean
Paired Samples Statistics				
WOMAC _{PRE}	64.5000	10	17.9521	5.6769
WOMAC _{POST}	23.9000	10	4.7481	1.5015
Paired Samples Test				
	Mean	Std. Deviation	t	df
Sig. (2-tailed)	40.6000	14.5694	8.812	9
WOMAC _{PRE} – WOMAC _{POST}				
0.000				

The paired t-test indicate that the intervention significantly reduced pain scores (mean difference = 4.50, $p < 0.001$) and WOMAC scores (mean difference=40.60, $p < 0.001$). These findings suggest that the intervention was effective in improving both pain levels and functional disability among the participants.

The intervention led to statistically significant improvements in pain and WOMAC scores, as evidenced by the paired t-tests ($p < 0.001$ for both). These results highlight the potential efficacy of the intervention in addressing pain and functional disability.

12. Discussion:

WXT is one of the most sought treatment of naturopathy in cases of osteoarthritis of knee joint. In this study we have used WXT for improving range of motion, reduced pain and swelling in subjects with osteoarthritis of knee joint and it has given effective results.

WXT was administered to 10 patients of either gender diagnosed with osteoarthritis of knee joint. The duration of the treatment was 10 days, by the end of 10th day improvement in the range of motion, alleviating pain and stiffness in osteoarthritic patients and it has given effective results. Naturopathy modalities have proven to be an effective mode of treating chronic disorders. Naturopathy being a drugless system, emphasizes on the self-healing capacity of the individual. It promotes homeostatic mechanisms in the body of individuals. The treatment modalities such as hydrotherapy, acupuncture, massage therapy, physiotherapy, fasting therapy and diet, etc., emphasizes on healing the patient condition without causing the adverse effect.

13. Conclusion:

Naturopathy modalities have proven to be an effective mode of treating chronic disorders. Naturopathy being a drugless system, emphasizes on the self-healing capacity of the individual. It promotes homeostatic mechanisms in the body of individuals. The treatment modalities such as hydrotherapy, acupuncture, massage therapy, physiotherapy, fasting therapy and diet, etc., emphasizes on healing the patient condition without causing the adverse effect.

In our study, we have used Wax therapy treatment modality, is of great value in improving the range of motion, alleviating pain and swelling in osteoarthritic patients of knee joint. The same has been observed in this study both statistically and clinically. The subjects showed good responses like improvement in Visual pain analog scale (VAS) and WOMAC score after 10 days of intervention. Thus, proving to be effective in conditions of osteoarthritis of knee joint.

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