"Use Of Hot Mud Application And Revulsive Compress As An Adjuvant To A Comprehensive Naturopathy Treatment In The Management Of Osteoarthritis Of Knee Joint"

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ABSTRACT:

Background: The purpose of the study was to investigate whether naturopathy & yoga treatments combined with hot mud therapy and revulsive compress in bringing changes in pain, disability and range of movements for patients with osteoarthritis knee.

Subjects and Methods: A total of ninety subjects with knee osteoarthritis were recruited for this study after satisfying the inclusion and exclusion criteria. They were randomly assigned to the following three interventions: naturopathy & yoga combined with hot mud application; combined with revulsive compress and naturopathy & yoga alone. Every subject was assessed for pain, disability and range of movement at baseline and following 10 days.

Results: The overall comparison between the groups was done by using ANOVA, which showed a difference in severity of pain, disability index and range of movement (ROM) in patients after their respective interventions. However, Hot mud therapy along with Naturopathy & Yoga showed more significance with respect to VAS ($p<0.001$), WOMAC ($p<0.001$), and Goniometry ($p < 0.001$) compared to other 2 groups.

Conclusion: This study concludes that, hot mud therapy group showed significance in VAS Score, WOMAC Disability index, & Goniometry in comparison with other 2 groups. Hence, hot mud application along with Naturopathy & yoga is highly effective in reduction of pain, disability and improvement in range of motion of OA knees.

KEYWORDS: Naturopathy; Osteoarthritis; hot mud application; revulsive compress; WOMAC; VAS.

INTRODUCTION

Osteoarthritis (O.A) is the common, chronic degenerative disorder of the joints which affects both weight bearing and non-weight bearing joints but most commonly affected in spine, hips, and knees.[1,2] The incidence of hand, hip and knee OA increases with age, Women have higher rates than men especially after the age of 50 years. Globally, OA knee is the eighth leading cause of disability than associated with other joint.[3,4] COPCORD studies in India, revealed a significantly higher prevalence of knee pain in the rural (13.7%) compared with urban (6%) community.[5,6] Pain, stiffness, joint swelling, coarse crepitus, limitations in walking, difficulty in stair climbing and squatting are common symptoms in patient with knee osteoarthritis (OAK) which greatly interferes with daily activities, recreation and have significant negative impact on health related quality of life (HRQOL).[7-8]

Naturopathy is the art and science of disease diagnosis, treatment and prevention using Natural modalities.[9] It is a system of man building in harmony with constructive principles of nature on physical, mental, moral and spiritual planes of being and consists of non-invasive treatment modalities like diet therapy, fasting therapy, mud therapy, hydro therapy, Massage therapy, Chromo therapy, air therapy and magnet therapy.[10] Naturopathic treatment

modalities also include hydrotherapy and mud therapy. Mud therapy widely used in the treatment of musculoskeletal diseases for pain relief.[11,12] Naturopathy is based on holistic and vitalistic principles.[13]

Revulsive compress[14] is a alternate application of hot (98-104 ^{0}F) /(36-40^{0}C) immediately followed by cold (55-65^{0}F)/(12-18^{0}C) application which improve blood circulation, ease inflammation, reduce edema, and strengthen the connective tissue. Both mud therapy and revulsive compress is a treatment of choice in the management of osteo arthritic knees (OAK) in naturopathy. Hence the present study was aimed to evaluate the efficacy of revulsive compress and hot mud application for patients with OA knee as an adjuvant therapy in naturopathy.

SUBJECTS AND METHODS

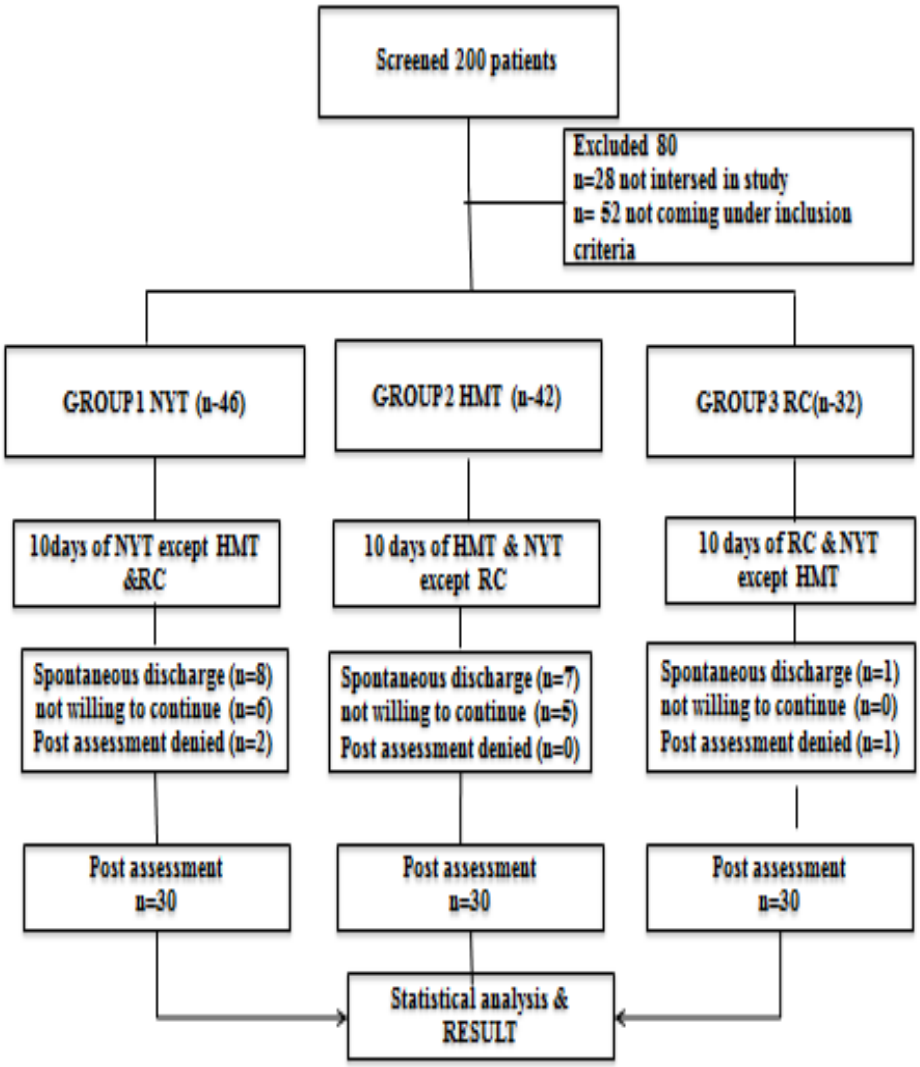
Ninety subjects (males -48, females -42) with ages ranging between 40 to 60 years participated in this study. Potential subjects were screened through a routine medical check-up and those satisfying diagnostic criteria of osteoarthritis of knee were randomly recruited from S.D.M Yoga & Nature Cure Hospital, Shanthivana, Dharmasthala for the three arm study group.

Subjects who fulfilled the Inclusion criteria were given information sheet having details regarding the nature of study and intervention to be used. Selected subjects were allocated into one of three groups. Group 1, Naturopathy & yoga (NYT): Subject received only yoga and naturopathy treatments for a period of 10 days. Naturopathy treatments include diet therapy, fasting therapy, full body mud therapy, hydro therapy, massage therapy, acupressure, and yoga therapy. Group 2, Hot mud therapy (HMT): Subject received hot mud application to knees for 30 minutes daily for the period of 10 days with yoga and naturopathy treatment. Mud was heated with water up to 45 °C then was applied to the affected knee covering an area of 5 cm above and below the patella for 30 minutes daily for the period of 10 days.

Group 3, Revulsive compress (RC): Subjects were received Revulsive compress to knees for 30 minutes daily for the period of 10 days with yoga and naturopathy treatment. In Revulsive compress**,** hot fomentation bag is applied over the knee for 4 minutes followed by a cold application (ice bag) is applied for 1 minute. This cycle is repeated for 4 times, followed by dry friction over knees for 10 minutes.

Subjects belonging to the groups were assessed using the selected outcome variables as ‘Pre’ assessment on 1st day and Post assessments were done after 10 days of intervention.

Fig 1: Trial Profile



The Visual analogue scale was developed by Cline.[15] this is considered to be a simple & reliable tool to measure subjective pain. It consists of a horizontal straight line of 10 centimetres marked on a clean white sheet. One end of the line marked 0 represents 'No pain' and the other end marked 10 represents 'Worst possible pain'. The subject is asked to indicate pain by marking a dot on this line. In present study VAS is used to measure the severity of pain at Baseline, and after ten days after respective treatments.

Western Ontario and McMaster Universities Secondary Osteoarthritis index (WOMAC) is widely used in the evaluation of Hip and Knee Osteoarthritis. It is a self-administered questionnaire consisting of 24 items divided into 3 subscales assess the three dimensions of pain, disability and joint stiffness in knee and hip osteoarthritis.[16]

Measurement of range of motion by Goniometry: Range of movement (flexion and extension) of knee joint was assessed by using goniometer. The normal Knee range of movement, flexion is 0- 130 and extension is 120- 0. [17]

RESULTS

The data were analyzed for the normal distribution by SPSS. For normally distributed variables, within group changes were assessed using paired t test and between group changes were assessed using ANOVA. Within group changes were assessed using Wilcoxon signed rank test for both VAS pre and post and WOMAC pre and post questionnaire, which showed statistically significant(p value <0.001).

Paired t test was used for Goniometer pre and post analysis, which showed statistically significant p value <0.011, <0.001, <0.001, <0.001) for right knee flexion, right knee extension, left knee flexion& left knee extension respectively. Between group analysis was done by Kruskal Wallis test for VAS& WOMAC with significant p value <0.001. ANOVA was used for between group analysis for Goniometer with significant p value.

Table 1: Descriptive Statistics for NYT, HMT and RC on Visual Analogue Scale (VAS).

VAS	PRE		POST		Wilcoxon Signed Ranks test
	MEAN	SD	MEAN	SD	P- VALUE
NYT	7.5	0.56	4.9	0.60	<0.001
HMT	7.6	1.0662	3.533	1.074255	<0.001
RC	7.6	0.614948	4.433	1.006302	<0.001

Fig 2: Represents mean of NYT, HMT and RC on Visual Analogue Scale (VAS)

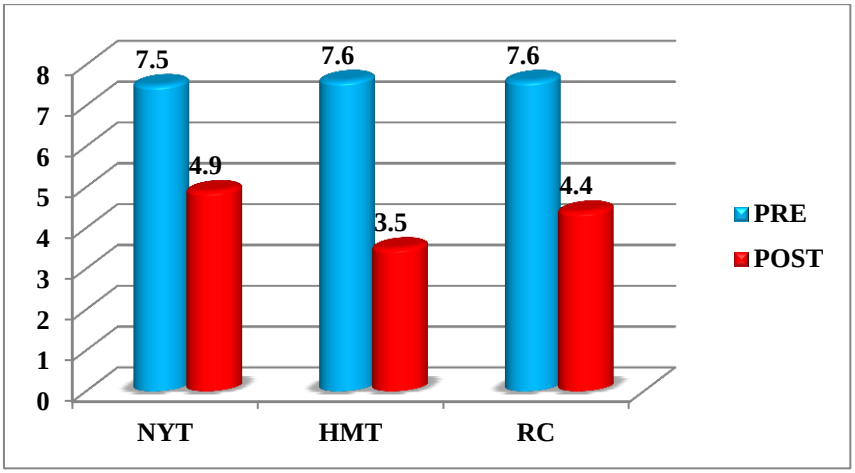


Table 2: Descriptive Statistics for NYT, HMT and RC on WOMAC

WOMAC	PRE		POST		Wilcoxon Signed Ranks test
	MEAN	SD	MEAN	SD	P- VALUE
NYT	49.633	3.44	29.733	6.63	<0.001
HMT	47.30	2.53	20.433	2.11	<0.001
RC	48.621	2.73	26.433	4.01	<0.001

Fig. 3: Represents mean of NYT, HMT and RC on WOMAC

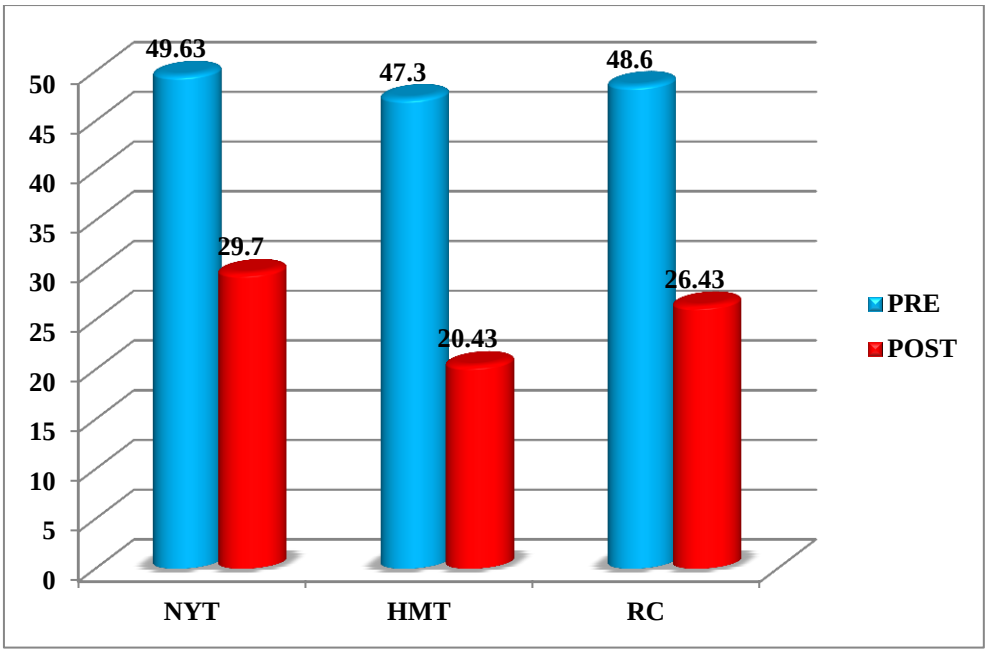


Table 3: Descriptive Statistics for GONIOMETRY IN NYT GROUP:

GONIMETRY	PRE		POST		PAIRED T TEST
	MEAN	SD	MEAN	SD	P-VALUE
RT KNEE FLEXION	84.5	4.37	80.3	1.6	<0.0001
RT KNEE EXTENSION	160	4.80	166	1.8	<0.0001
LT KNEE FLEXION	83.2	4.45	80.16	0.91	<0.0001
LT KNEE EXTENSION	166	3.8	169	1.8	<0.0001

Figure 4: Represents mean for GONIOMETRY IN NYT GROUP

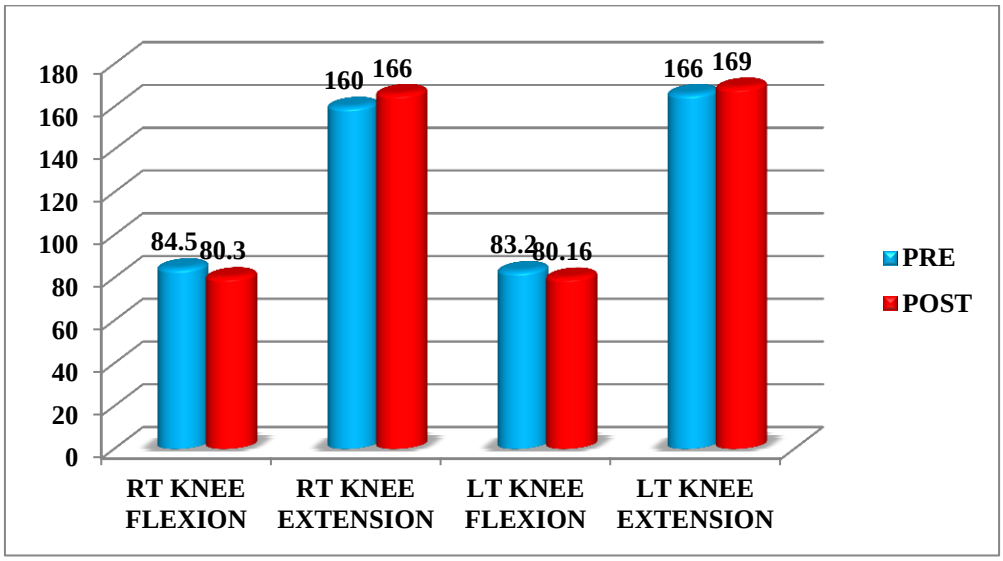


Table 4: Descriptive Statistics for GONIOMETRY IN HMT

GONIMETRY	PRE		POST		PAIRED T TEST
	MEAN	SD	MEAN	SD	P-VALUE
RT KNEE FLEXION	85.833	6.95	79.33	6.39	<0.0001
RT KNEE EXTENSION	171.33	4.09	163.66	3.79	<0.0001
LT KNEE FLEXION	83.5	7.08	80.33	5.56	<0.0001
LT KNEE EXTENSION	171	4.43	166	3.13	<0.0001

Figure 5: Represents mean of GONIOMETRY IN HMT GROUP

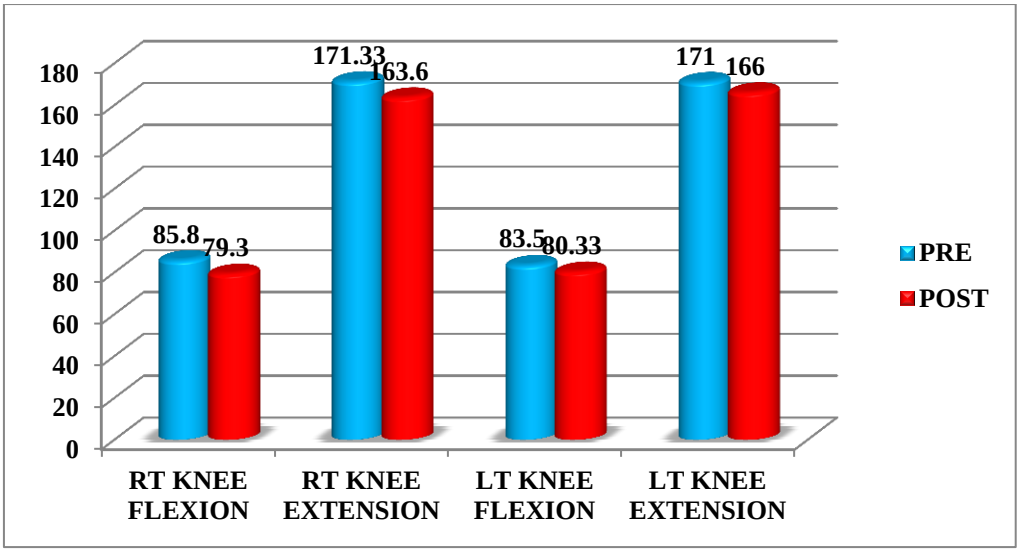


Table 5: Descriptive Statistics for GONIOMETRY IN RC GROUP

GONIMETRY	PRE		POST		STUDENT T TEST
	MEAN	SD	MEAN	SD	P-VALUE
RT KNEE FLEXION	85.83	6.44	79.96	6.38	<0.0001
RT KNEE EXTENSION	171	3.65	167	3.05	<0.0001
LT KNEE FLEXION	83.5	6.58	80.66	5.25	<0.0001
LT KNEE EXTENSION	171	4.04	166	2.65	<0.0001

Figure 6: Represents mean of GONIOMETRY IN RC GROUP

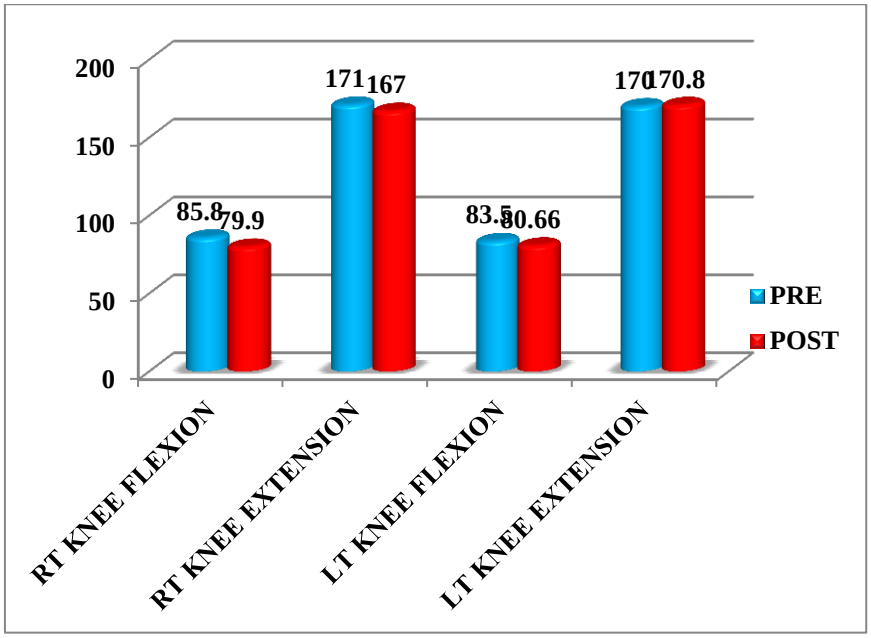


Table 6: Between groups comparison of VAS using Kruskal Wallis Test

VAS	POST VALUES		Kruskal Wallis Test
	MEAN	SD	P VALUE
NYT	4.9	0.69	<0.001
HMT	3.533	1.014	<0.001
RC	4.433	1.006	<0.001

Fig.7: Represents between mean comparison of VAS

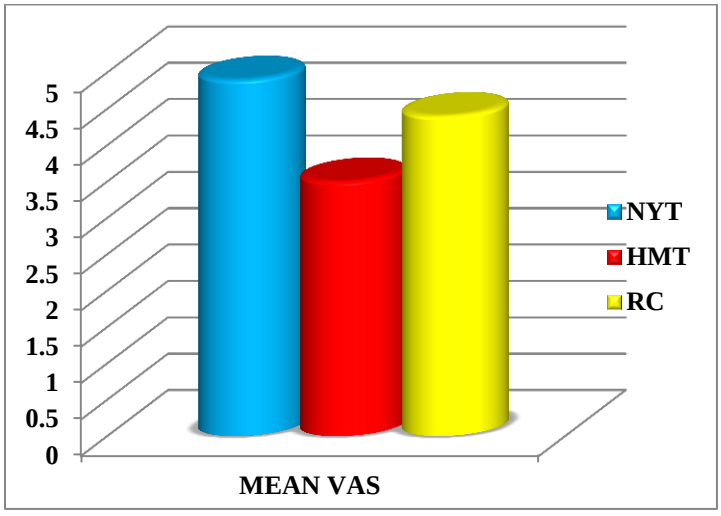


Table 7: Between groups comparison of WOMAC using Kruskal Wallis Test

WOMAC	POST VALUES		Kruskal Wallis Test
	MEAN	SD	P VALUE
NYT	29.73	6.63	<0.001
HMT	20.43	2.11	<0.001
RC	26.43	4.01	<0.001

Fig.8: Represents between mean comparison of WOMAC

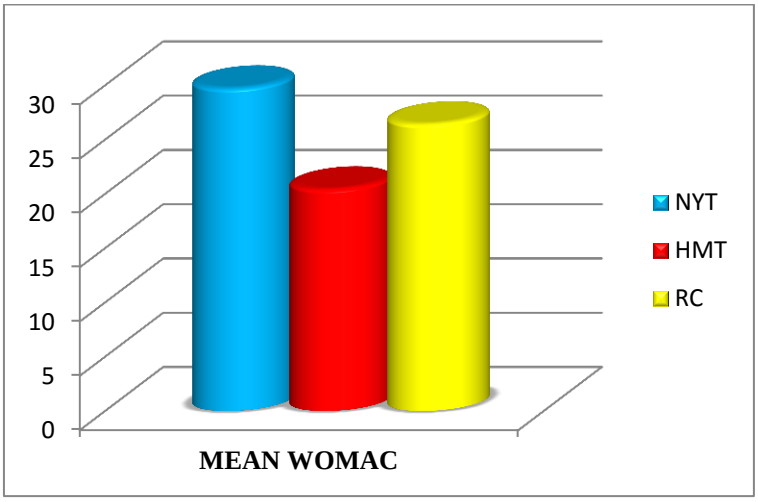
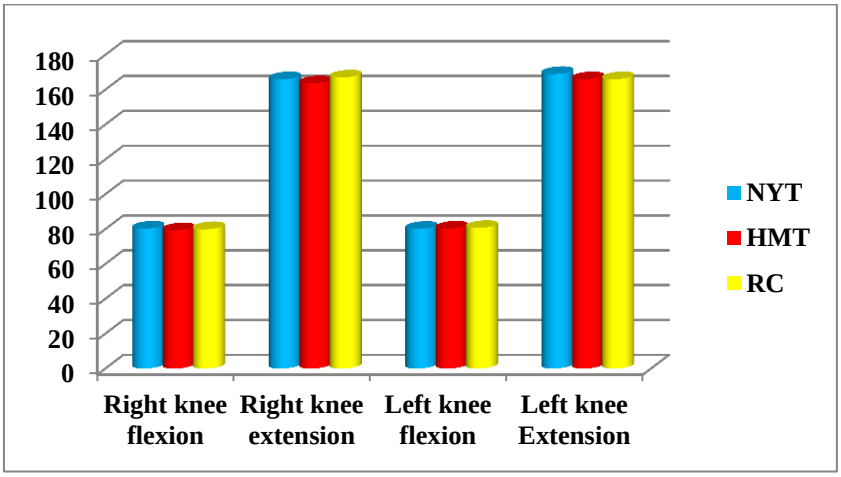


Table 8: Between groups comparison of Goniometry using ANOVA

Goniometry	NYT		HMT		RC		ANOVA
	Mean	SD	Mean	SD	Mean	SD	P value
Right knee flexion	80.3	1.6	79.33	6.39	79.96	6.38	0.038
Right knee extension	166	1.8	163.66	3.79	167	3.05	0.774
Left knee flexion	80.16	0.91	80.33	5.56	80.66	5.25	0.842
Left knee Extension	169	1.8	166	3.13	166	2.65	0.068

Fig.9: Represents between mean comparison of GONIOMETRY



DISCUSSION

The main aim of the study was to compare the influence of hot mud application and revulsive compress with naturopathy and yogic treatments in alleviating knee pain, improving range of motion and improving the functional quality of life in patients with bilateral knee Osteoarthritis. Water properties, particularly those associated with buoyancy, which potentially reduces joint loading.[18] mud-pack therapy are decrease in the levels of tumor necrosis factor-alpha (TNF-α) resulting in decreased inflammatory reaction and cartilage damage, maintenance of cartilaginous hemostasis through decreasing serum

levels of nitric oxide and myeloperoxidases, and decrease in serum concentrations of inflammatory mediators such as prostaglandin E2 (PGE2) and leukotriene B4 (LTB4). There is also general assumption that thermal stimulation induces increases in serum levels of noradrenaline, cortisol, and beta-endorphins leading to anti-inflammatory and analgesic effect.
Poensin et al demonstrated that Mud-pack therapy caused enhancement of skin blood circulation, which was possibly induced by local mechanisms, in particular transcutaneous ion transfer. Besides, some studies suggested that sulfur minerals absorbed by the skin might cause an analgesic effect. Mazzulla et al proposed that sulfur in the mud induced the production of carotene, vitamins, and phytosterol in the skin matrix leading to an anti-inflammatory effect.

Ice applications after acute phases of degenerative joint diseases increase pain threshold through decreasing Na-K pump activity in nerve endings, repolarization, and excitability, decrease nerve conduction velocity, and help relieve pain through gate-control mechanisms. In contrast, local hot applications induce vasodilatation, which in turn increases blood flow, metabolism, and viscoelasticity of connective tissue, resulting in resolution of muscle spasm and pain relief.[19]

Present study shows significant difference in reducing pain, stiffness, improving physical function, improvement in flexion of both knees. Physical health, Emotional health, social functioning, emotional well-being, fatigue and energy. Massage is theorized to work through a variety of mechanisms, increased blood circulation to the muscles promoting gas exchange and delivery of nutrients and removal of waste products has long been thought to be one of the outcomes and benefits of massage, and recent studies support this effect[20- 24]similar effect evidenced by Myrer et al, proposed that contrast therapy, the study reported to produce physiologic effects such as vasodilation and constriction of local blood vessels, changes in blood flow, reduction in swelling, inflammation and muscle spasm and significant fluctuations of muscle temperature must be produced by the alternating hot–cold contrast treatments.[25]

Mud has a unique property to absorb heat and toxins from the body. It also dissolves and transforms the toxins within the body into such a state whereby they could be easily driven out from the body. It reduces the rigidity of muscles, softens the hard tissues and dissolves hard fatty glands within or over the body. It starts its function right from the moment of its application over the affected site and consequently the patient observes relief from the symptoms. During the excess amount of toxins in the body, mud gets hot sooner after application in accordance of the body temperature.[26]

In pilot studies on OA knees involving yoga, Kolasinski*et al*,[27]Ranjitaet al.[28] showed a better reduction of pain in the yoga group than the control group. In our study the degree of changes appears to be similar in all the 3 groups since every subject underwent yoga, thus Yoga aids efficacy in bilateral knee joint pain.

A proposed pain-relief mechanism common to both local heat and cold includes the gate control theory of pain. Apart from this, an increase in the current perception threshold of sensory nerve fibers associated with local heat, and decreased nerve conduction velocity associated with local cold, are also involved in pain relief[29]

The previous studies gives the evidences for hydrotherapy, yoga, mud therapy , manipulative therapy and Nutrition in alleviating the pain intensity, Improving range of motion , improvement in the quality of life and health status in patient with bi-lateral knee Osteoarthritis. In the present study the combination of these therapies showed significant result in terms of pain intensity, improving the joint motion and improvement of health status in patient with bilateral knee osteo arthritis without any adverse effects.

This study has revealed a statistically significant improvement in respect to all the domains of the WOMAC score with significantly better improvements in the hot mud than in revulsive application group. The findings of our study indicate that all the three interventions were comparable in improving pain, disability and functional quality of life. However, Naturopathy and Yoga when employed together with hot mud application; every subject reported a significant reduction in disability, pain perception and improvement in the physical functions

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