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EFFECTIVENESS OF HEAT AND COLD APPLICATION WITH RANGE OF MOTION ON PAIN, JOINT STIFFNESS AND PHYSICAL ACTIVITY AMONG OLDER ADULTS WITH KNEE OSTEOARTHRITIS

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ABSTRACT

Abstract : Knee osteoarthritis is a common age related, chronic and slowly progressive joint disorder may leads to joint failure. The prevalence of osteoarthritis increases due to population ageing and related risk factors.

Objective: To assess and compare the effectiveness of heat and cold application with range of motion exercise among older adults with knee osteoarthritis.

Methodology: Comparative quasi experimental design of two independent groups with two pre-test and two post-test was adopted. One hundred and forty seven older adults with knee osteoarthritis were selected using purposive sampling technique. Five Instruments were used to collect the data from the participants. Semi-structured interview schedule, Anthropometric measurements, Visual analogue scale, Kellgrans and Lawrence classification, Goniometer, Modified WOMAC Index.

Results: and conclusion : Interventions like heat application with range of motion exercise were found to be effective and resulted in reduction of pain, stiffness and promotion of physical activities. The older adults with knee osteoarthritis participants were motivated to continue the interventions along with range of motion exercise regularly in the home. It helps the knee osteoarthritis participants to get immediate relief from the symptoms of knee osteoarthritis.

KEYWORDS : Knee osteoarthritis, pain, joint stiffness, physical activity, range of motion

1. INTRODUCTION :

Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterised by the loss of articular cartilage, hypertrophy of bone at the margins, sub chondral sclerosis and many biochemical and morphological alterations of the synovial membrane and joint capsule[6]. Pathological changes are the late stage of osteoarthritis that includes softening, ulceration and focal disintegration of the articular cartilage. Typical clinical symptoms are pain, particularly after prolonged activity and stiffness is experienced after inactivity[1]. It is probably not a single disease but represents the final end result of various disorders leading to joint failure. It is also known as degenerative arthritis, which commonly affects the hands, feet, spine, and large weight-bearing joints such as the hips and knees[6].

1.1. Prevalence of knee osteoarthritis:

Osteoarthritis is a most prevalent musculoskeletal disease in the world[3], More than 50% of population over 65 years had radiographic confirmation of osteoarthritis in any one of the joints and younger population was prone to injury-induced osteoarthritis. Europe and USA was highest in worldwide[4]. 18% of women and 9.6% of men were universally reported with symptomatic osteoarthritis in 60 years and higher age group[7]. Globally knee osteoarthritis is a 4th most significant cause of incapability in women and men[2]. Approximately 40% population of more than 70 years showed osteoarthritis, in which nearly 2% had severe knee pain and disability. Increment in age exponentially increases the allied risk of osteoarthritis, due to progressive changes in routine diet, working conditions and lifestyle patterns. A survey based study revealed that, India is predicted as chronic disease capital by 2025[5]. Prevalence study reported that nearly 80% of population showed a symptoms of osteoarthritis. Among that cases, approximately 20% of the people reported incapability in daily activities and around 11% need peculiar care[2].

2. Statement of the problem:

A comparative study to evaluate the effectiveness of heat and cold application with range of motion on pain, joint stiffness and physical activity among older adults with knee osteoarthritis.

2.1. AIM :

The aim of the present study is to compare the effectiveness of heat application and cold application with range of motion on pain, joint stiffness and physical activity among older adults with knee osteoarthritis.

2.2. OBJECTIVES

1. To assess and compare the health status of pain, joint stiffness and physical activity among older adults with knee osteoarthritis after heat and cold application.
2. To assess and compare the effectiveness of heat and cold application with range of motion exercise among older adults with knee osteoarthritis.

3. MATERIALS AND METHODS

3.1. Participants :

Comparative quasi experimental design of two independent groups with two pre test and two post test was adopted. Purposive sampling technique was used for this study. The study was conducted after getting the written approval from the Institutional Human Ethics Committee of Saveetha University, Tamilnadu (010/11/2013/IEC/SU; dated on 15.11.2013) and Indira Gandhi Government General Hospital and Post Graduate Institute, Puducherry (NO.GHSAC/2017;dated on 23.8.2017). Written consent was obtained from the older adults with primary knee osteoarthritis for their participation in this study. The total sample consisted of 75 in the experimental group 1 and 72 in the experimental group 2.

3.2. Inclusion and exclusion criteria :

Primary knee osteoarthritis with the age group between 40 to 70 years, both men and women on oral medications were included. Knee osteoarthritis with other associated medical problems such as cardio vascular problem, renal problem along with secondary knee osteoarthritis with other interventions like topical application of medications, infra-red therapy were excluded.

3.3. Methodology:

Using purposive sampling techniques 147 primary knee osteoarthritis were selected. The study details were explained and informed, consent was taken after which they were assigned into experimental group 1- heat application and experimental group 2- cold application. The total sample consist of 75 in the experimental group 1 and 72 in the experimental group 2. The details about the

research procedure and its benefits were explained to the knee osteoarthritis participants. Written consent was obtained from the older adults with primary knee osteoarthritis for their participation in this study. The tools used were demographic and clinical proforma to collect baseline information. Pre assessment on the level of pain intensity was analysed by using visual analogue scale. The pain intensity score was interpreted as no pain (0 – 4 mm), mild pain (5 – 44 mm), moderate pain (45–74 mm) and severe pain (75–100 mm). The kellgrans and lawrence classification measures the severity of knee osteoarthritis, using five grades. In this study grade 1 and grade 2 were included. Goniometer was used to assess the range of motion of the knee joint. Modified WOMAC index is a standardized scale used for taking into account in assessing pain, stiffness and functional limitation. Consisting of 24 items divided into 3 subscales. Sub scale 1, consisting of pain (5 items) includes walking, using stairs, in bed, sitting or lying, and standing upright position. Sub scale 2, consisting of stiffness (2 items) which includes early morning waking and later in the day. Sub scale 3, physical function (17 items). The score was interpreted as none (0), mild pain(1), moderate pain(2), severe pain(3). Instructions were given in the local language and the total score was recorded. Intervention and its benefits had been explained to the participants.

3.4. Data collection procedure:
Experimental group 1 participants were received heat application by using hot pack wrapped in a cotton bag for 15- 20 minutes . After

10 minutes of interval the active assisted range of motion exercise was administered for 30 minutes, Thereafter 10 minutes of interval, once again heat application was administered for 15-20 minutes for each participant respectively and continued for the period of 2 weeks. Experimental group 2 participants were received cold application by using cold pack wrapped in a cotton bag for 15- 20 minutes of temperature. After 10 minutes of interval, the active assisted range of motion exercise was administered for 30 minutes, Thereafter 10 minutes of interval, once again cold application was administered for 15-20 minutes for each participant respectively, intervention was given minimum 1 hour per day and continued for 2 weeks. After 2 weeks of intervention the post test was carried out with the same parameters to compare the effectiveness of experimental group 1 and experimental group 2.

3.5 Statistics:
The data were expressed in mean ± SE, median, the Wilcoxon signed rank test and Mann-Whitney rank sum test was used to find out the effectiveness of the intervention on the level of pain, stiffness and physical activity among older adults with knee osteoarthritis. The analysis and plotting of graphs were carried out using Sigmaplot 13 (Systat software Inc.,USA).

4. Results and Discussion

Based on objectives, the results are discussed below,

WOMAC Index	Group	Mean ± S.E	Median	Mann Whitney rank sum test		Wilcoxon signed rank test	
				Heat & Cold Pretest	Heat & Cold Posttest	Heat Pretest & Post Test	Cold Pretest & Post Test
Pain	Heat-Pretest	14.09±0.19	14.0 (13.0–1.0)	T=2589 P=.0.662 Z=0.437	T=162 P<0.001 Z=9.930	W=6786 P<0.001 Z = 9.365	W=2628 P<0.001 Z = 7.451
	Cold-Pretest	14.29±0.23	14.0 (13.0–6.0)				
	Heat-Post	2.71±0.28	2.0 (0.0 – 6.0)				
	Cold-Post	10.52±0.26	10.50 (9.0 – 12.0)				
Stiffness	Heat-Pretest	5.38±0.09	5.0 (5.0 – 6.0)	T=2293.50 P=.0.094 Z=1.673	T=71.50 P<0.001 Z=10.627	W=6903 P<0.001 Z = 9.484	W=1596 P<0.001 Z = 6.686
	Cold-Pretest	5.22±0.11	5.0 (5.0- 6.0)				
	Heat-Post	0.38±0.07	0.00 (0.0-0.0)				
	Cold-Post	4.03±0.12	4.0 (3.0 – 5.0)				
Physical	Heat-Pretest	51.61±0.24	52.0 (50.0 – 53.0)	T=2295.50 P=.0.114 Z=1.581	T=0.0 P<0.001 Z=10.483	W=6903 P<0.001 Z = 9.398	W=2556 P<0.001 Z = 7.331
	Cold-Pretest	51.83±0.35	52.0 (50.0 – 54.0)				

Table 1: Comparison of pretest and post test scores in pain, stiffness and physical Activity between experimental group1 and experimental group 2 .N = 147

Table 1 . Level of pain : Represents the comparison of pain in pretest and post test of experimental group1 and group 2 among older adults with knee osteoarthritis. The data is a discrete variable, scored value and also with wide range non-parametric statistics were carried out using the medians. The median score of experimental group 1 and group 2 in the pre-test were 14.0 and 14.0 respectively. It was not statistically significant (P=0.662). The post test score of experimental group 1 was 2.0 it was lesser than the post test score 10.50 in the experimental group 2 . Mann-Whitney rank sum test used and p value obtained was p<0.001, which was found to be highly significant.

Level of joint stiffness : Table 1 represents the comparison of joint stiffness in pretest and post test of experimental group1 and group 2. The median score of experimental group1 and group 2 in the pre-test were 5.0 and 5.0 respectively. It was not statistically significant (P=0.094).The post test score of experimental group 1 was significantly lesser than the post test score of 4.0 in the experimental

group 2. Mann-Whitney rank sum test used and p value obtained was p<0.001, which was found to be highly significant. The comparison of the post test level of stiffness using Mann-Whitney rank sum test p value was p<0.001, which was found to be highly significant.

Level of physical activity :
Table 1 represents the comparison of physical activity in pretest and post test of experimental group 1 and group 2. The median score of experimental group 1 and group 2 in the pre-test were 52.0 and 52.0 respectively. It was not statistically significant (P=0.114). The post test score of experimental group 1 was 13.0 it was lesser than the post test score of 43.0 in the experimental group 2. Mann-Whitney rank sum test used and p value obtained was p<0.001, which was found to be highly significant. The comparison of the post test level of physical activity of using Mann-Whitney rank sum test, p value obtained was p<0.001, which was found to be highly significant.

The figure 1 : Represents the effectiveness of intervention with range of motion among older adults with knee osteoarthritis with in the experimental group 1 and group 2. Box plot showed the effect of heat and cold application with range of motion among older adults with knee osteoarthritis. In the experimental group 1 median value was 100 in the pretest and the score was increased into 110 in the post test. Where as the range of motion flexion post test score was increased 10 degree from the pre test score, which was found to be significant at the level of p<0.001. There was no significant difference between the pre test and post test score of experimental group 2. The p value obtained was p=0.59, which was not found to be significant.
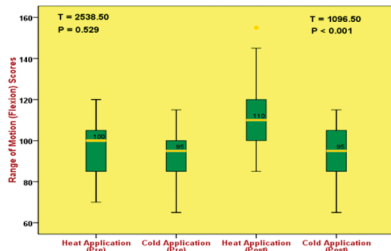
Figure 1 : Effectiveness of range of motion(flexion)scores between experimental group1 and group2 .
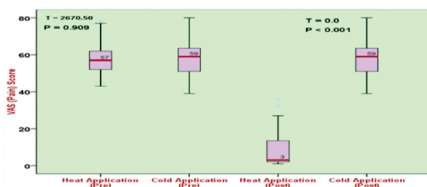
The middle green line is the median and the yellow line is mean .

N - group1 =75 ; N - group 2 =72

The pre-test score of experimental group1 and group 2 were compared by Mann Whitney rank sum test. T = 2538, P =0.529 .

The post-test score of experimental group1 and group 2 were compared by Mann Whitney rank sum test. T = 1096.50, P <0.001.

The figure 2 : Shown below, represents the pain intensity before and after intervention among older adults with knee osteoarthritis between the experimental group1 and group 2 .The median score of experimental group1 and group2 in the pre-test were 61.0 and 59.0 respectively. It was not statistically significant (P=0.909).The post test score of experimental group 1 was 3.0 it was lesser than the post test score of 45.0 in the experimental group 2. Mann-Whitney rank sum test used and p value obtained was p<0.001, wWhich was found to be highly significant .The comparison of the post test level of pain intensity using using Mann-Whitney rank sum test p value was p<0.001, Which was found to be highly significant.

Figure 2: Pain intensity score of pre test and post test between the experimental group1 and experimental group2.

The middle lavander line is the median and the red line is mean . N - group1 =75 ; N - group 2 =72

The pre-test score of experimental group1 and group 2 were compared by Mann Whitney rank sum test. T =2670.50 , P =0.909.

The post-test score of experimental group1 and group 2 were compared by Mann Whitney rank sum test. P <0.001
Significantly different from the pre –test .

CONCLUSION :
There was a significant improvement found between the post test of experimental group 1 compared with post test of experimental group 2 by using Mann-whitney test. Median score of experimental group 1 was lesser than the experimental group 2 in all the three parameters. It was shown that the experimental group 1 was more effective than experimental group 2. Similar study on heat and cold therapy were often recommended to relieve an aching pain. The symptoms of pain, stiffness and muscle weakness are serious risk factors for mobility limitation and can lead to impaired quality of life for the affected population (Likivaino et al., 2008). The experimental group 2 was effective in reducing swelling and inflammation. In physical activity and range of motion parameters was showed improvement on the walking in flat ground and doing domestic activities in both the groups.

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