



## EFFECT OF CRYOTHERAPY ON THE LEVEL OF PAIN AMONG SELECTED POSTOPERATIVE ORTHOPEDIC SURGERY PATIENTS IN A SELECTED SETTING AT MANGALURU

### Nursing

|                              |                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Nancy Divya DSilva*</b>   | II M.Sc Nursing student, Department of Medical Surgical Nursing, Father Muller College of Nursing, Kankanady, Mangaluru. *Corresponding Author |
| <b>Sonia D'Souza</b>         | M.Sc(N), Associate Professor, Department of Medical Surgical Nursing, Father Muller College of Nursing, Kankanady, Mangaluru.                  |
| <b>Sr. Susamma Varughese</b> | M.Sc(N), Assistant Professor, Department of Medical Surgical Nursing, Father Muller College of Nursing, Kankanady, Mangaluru.                  |

### ABSTRACT

**Introduction:** The pain and swelling during the post-operative orthopaedic surgery mainly affect the recovery period. Cryotherapy is one among the many non pharmacological interventions which helps in reducing the post operative orthopaedic pain.

**Objective:** To assess the effectiveness of cryotherapy on pain among selected postoperative orthopedic surgery patients in the experimental group.

**Materials and Methods:** A Quasi – Experimental time series design was used for the study. Thirty two subjects were selected by purposive sampling technique and were assigned to the experimental and control group by random allocation using envelope method. The pre-test pain level was assessed using Numerical Pain Rating Scale. Cryotherapy was provided to the subjects in experimental group, 1 hour prior to the scheduled dose of analgesic for 15 minutes on their first and second postoperative day, the control group received the routine care and post-test level of pain was assessed after the intervention in both the groups.

**Results:** The results showed that there was a significant reduction in the level of pain in the experimental group at repeated time intervals ( $P=0.001$ ). The unpaired 't' value ( $t_{(30)} = 15.3$ ,  $P = 0.001$ ) showed that there was a significant difference in the mean post-test pain scores in the experimental and control group.

**Conclusion:** The findings of the study showed that cryotherapy was effective in reducing the level of pain among the postoperative orthopedic surgery patients.

### KEYWORDS

Effect; Cryotherapy; Post Operative Pain; Orthopaedic Surgery.

### INTRODUCTION

Orthopedic surgery is a branch of surgery concerned with the conditions involving the musculoskeletal system. According to Indian Society of Hip and Knee Surgeons Joint Registry report it states that TKA and THA are most widely practiced surgical options for arthritis and its application is high in India. Joint registry showed that 34,478 TKAs and 3,604 THA were done by 42 surgeons across India. Out of 34,478 TKAs 8,612 were males (25%) and 25,866 were females (75%). Average age was 64 years (osteoarthritis). The indication for TKA was osteoarthritis in 33,444 (97%). The total hip arthroplasty done were 3,604 out of which 2,162 (60%) were males and 1,442 (40%) were females<sup>1</sup>.

Despite the increasing interest in postoperative pain management and development of pain control modalities, more than half of the patients who undergo surgery experience inappropriate level of postoperative pain. Cold and compression are routinely applied immediately after acute injury or following surgery to alleviate pain, reduce swelling and speed functional recovery<sup>2</sup>.

Cryotherapy is the use of cold to decrease pain when tissue is damaged secondary to trauma or surgery<sup>3</sup>. Post operative pain can have significant effect on patient's recovery. Cold application is a simple and inexpensive therapy which has been accepted for decades as a non pharmacological intervention for pain management. It increases pain threshold, decreases inflammatory reaction and spasm<sup>4</sup>.

### Objectives of the study

1. To assess the pre-test level of pain among postoperative orthopedic surgery patients in experimental and control group using Numerical Pain Rating Scale.
2. To assess the effectiveness of cryotherapy on pain among postoperative orthopedic surgery patients in the experimental group.
3. To compare the posttest level of pain among postoperative orthopedic surgery patients in experimental group and control group after cryotherapy.
4. To find the association between pretest level of pain among postoperative orthopedic surgery patients with the selected demographic variables in experimental group and control group.

### MATERIALS AND METHODS:

Quasi experimental time series design was used for this study. The study was conducted from 25th February 2019 to 23rd March 2019 in the 90 bedded male and female orthopaedic wards of Father Muller Medical College Hospital (FMMCH), Mangaluru. Formal permission was obtained from the Institutional Ethics Committee of FMMCH (FMMCIEC/CCM/78/2018) prior to the data collection. The inclusion criteria was male and female patients in the age group of 19-70 years who have undergone the orthopaedic surgeries like hemiarthroplasty, Total Knee Replacement (TKR), arthroscopy mediated surgeries, lower limb internal fixation on their first and second post-operative day. The study excluded patients with neuromuscular disorders. Attrition rate was considered as 10% and the sample size was estimated using the following formula:

$$n = \frac{2\sigma^2(Z\beta + Z\alpha)^2}{d^2}$$

Purposive sampling was used to select 32 subjects and subjects were assigned to experimental group ( $n_1=16$ ), control group ( $n_2=16$ ) by envelope method. The researcher introduced herself to the subjects and the purpose of the study was explained to them and written informed consent was obtained. The data was collected using Baseline Proforma, Numerical Pain Rating Scale in the experimental and control group. Experimental group received cryotherapy in the morning (7am) and evening (7pm), 1 hour prior to the scheduled dose of analgesic for 15 minutes on their first and second postoperative day that is the experimental group received the cryotherapy in 4 sessions while control group received routine hospital treatment. Post-test was conducted after each intervention.

### STATISTICAL ANALYSIS

Demographic data of the subjects were analyzed by using frequency and percentage. The level of pain among subjects were analyzed by using descriptive statistics and expressed in terms of grades, frequency, percentage, mean and standard deviation (SD). The data was analysed using one way repeated measure ANOVA, unpaired t test, chi square test using SPSS software version 25.

### RESULTS:

#### Demographic Characteristics in the Experimental and Control Group

Among 32 subjects, 12 (37%) of subjects had undergone lower limb

internal fixation. Majority (37%) of subjects in the experimental group and control group were in the age group of 49 to 58 years. The homogeneity of experimental and control group consisting of 16 subjects each was calculated using the Chi Square test for all the demographic variables and the calculated P value ( $P>0.05$ ) showed that both the groups were homogenous. The mean pain scores of experimental and control groups was normally distributed along the Q-Q plot and hence the further statistical analysis was done using parametric tests.

**Table 1: Mean Pretest And Mean Posttest Scores Of Pain In The Experimental And Control Group.**

n=16+16

| Pain Level         |             |           |               |       |               |       |
|--------------------|-------------|-----------|---------------|-------|---------------|-------|
| Experimental Group |             |           | Control Group |       |               |       |
| Days               | Session     | Variable  | Mean $\pm$ SD | Mean% | Mean $\pm$ SD | Mean% |
| POD 1              | Session I   | Pretest 1 | 8.1 $\pm$ 0.6 | 81    | 7.6 $\pm$ 1   | 76    |
|                    |             | Posttest1 | 4.3 $\pm$ 0.8 | 43    | 7.1 $\pm$ 0.9 | 43    |
|                    | Session II  | Pretest2  | 7.5 $\pm$ 0.8 | 75    | 7.7 $\pm$ 1   | 75    |
|                    |             | Posttest2 | 3.5 $\pm$ 0.8 | 35    | 7.4 $\pm$ 0.8 | 35    |
| POD 2              | Session III | Pretest 3 | 7.5 $\pm$ 0.8 | 75    | 7.3 $\pm$ 1.2 | 75    |
|                    |             | Posttest3 | 3.3 $\pm$ 1   | 33    | 7.0 $\pm$ 0.8 | 33    |
|                    | Session IV  | Pretest4  | 7 $\pm$ 0.8   | 70    | 7.3 $\pm$ 0.9 | 70    |
|                    |             | Posttest4 | 2.8 $\pm$ 0.5 | 28    | 6.9 $\pm$ 0.9 | 28    |

Max Score: 10

The data in the table 1 shows that the mean posttest pain scores are lower than the mean pretest pain scores in the experimental group.

**Table 2: Comparison of Mean Pretest and Posttest Pain Scores in the Experimental Group at Repeated Time Intervals.**

n=16

| Experimental Group   |                   |            |      |     |         |         |          |
|----------------------|-------------------|------------|------|-----|---------|---------|----------|
| Pain Level           |                   |            |      |     |         |         |          |
| Days                 | Session           | Variables  | Mean | SD  | F value | P value | $\eta^2$ |
| Post operative day 1 | Session I (7am)   | Pretest 1  | 8.1  | 0.6 | 99.2    | 0.001*  | 0.98     |
|                      |                   | Posttest 1 | 4.3  | 0.8 |         |         |          |
|                      | Session II (7pm)  | Pretest 2  | 7.5  | 0.8 |         |         |          |
|                      |                   | Posttest 2 | 3.5  | 0.8 |         |         |          |
| Post operative day 2 | Session III (7am) | Pretest 3  | 7.5  | 0.8 |         |         |          |
|                      |                   | Posttest 3 | 3.3  | 1   |         |         |          |
|                      | Session IV (7pm)  | Pretest 4  | 7    | 0.8 |         |         |          |
|                      |                   | Posttest 4 | 2.8  | 0.5 |         |         |          |

$F_{(5,95)}=2.31, p<0.05$

\*Significant

The data presented in the table 2 shows that the calculated  $P=0.001$  is less than 0.05 indicating that there is a significant difference in the mean pretest and posttest pain scores in the experimental group at repeated time intervals. The  $\eta^2$  value 0.98 indicates a larger effect size of cryotherapy on post operative pain in experimental group. This shows that cryotherapy has a large effect on pain among post operative orthopaedic patients and the effect was not by chance.

**Table 3: Comparison of Posttest Scores Of Pain In The Experimental Group And Control Group**

n=16+16

| Pain Scores |            |                          |                 |               |                |         |    |         |                          |
|-------------|------------|--------------------------|-----------------|---------------|----------------|---------|----|---------|--------------------------|
| Days        | Session    | Variables                | Mean difference | SD difference | Standard error | t value | df | P value | 95% CI of the difference |
|             |            |                          |                 |               |                |         |    |         | Lowerupper               |
| POD 1       | Session I  | Post-test 1 experimental | 2.8             | 0.1           | 0.1            | 8.5     | 30 | 0.001*  | -3.4-2.1                 |
|             |            | Post test 1 control      |                 |               | 0.2            |         |    |         |                          |
|             | Session II | Post test 2 experimental | 3.9             | 0             | 0.2            | 13.0    | 30 | 0.001*  | -4.5-3.3                 |
|             |            | Post test 2 control      |                 |               | 0.2            |         |    |         |                          |

|       |             |                          |     |     |     |      |    |        |          |
|-------|-------------|--------------------------|-----|-----|-----|------|----|--------|----------|
| POD 2 | Session III | Post test 3 experimental | 3.7 | 0.2 | 0.2 | 11.0 | 30 | 0.001* | -4.2-2.9 |
|       |             | Post test 3 control      |     |     | 0.2 |      |    |        |          |
|       | Session IV  | Post test 4 experimental | 4.1 | 0.4 | 0.2 | 15.3 | 30 | 0.001* | -4.6-3.5 |
|       |             | Post test 4 control      |     |     | 0.1 |      |    |        |          |

$t_{(30)}=2.09, p<0.05$

\*Significant

The data presented in the table 3 shows that the calculated value ( $P=0.001$ ) is less than 0.05 indicating that there is a significant difference in the mean post-interventional pain scores in the experimental and control group. Hence the cryotherapy was found effective on pain among post operative orthopedic patients.

#### Association Between the Pretest level of Pain among Postoperative Orthopedic Surgery Patients and Selected Demographic Variables in the Experimental and Control Group.

The P values of age, gender, type of surgery, past experience of undergoing surgery are greater than 0.05 indicating that there is no significant association between the pre-interventional level of pain and selected demographic variables in the experimental and control group.

#### DISCUSSION

In the present study mean pretest pain score in the experimental group was  $\bar{X}_1=8.1\pm0.6$  and in the control group was  $\bar{X}_2=7.6\pm1$  during the session I. The mean posttest pain scores in experimental group was  $\bar{X}_3=2.8\pm0.5$  and in control group was  $\bar{X}_4=6.9\pm0.9$  during the session IV. This findings are congruent with the study conducted by Lessard LA, Scudds RA, Amendola A, Vaz MD to assess the efficacy of cryotherapy following knee surgery which shows that the mean posttest pain scores  $\bar{X}_5=3.78\pm0.8$  was lower in experimental group than the control group ( $\bar{X}_6=6.97\pm1$ )<sup>5</sup>.

The findings inferred that there is a significant difference in the mean pre and post-test pain score in the experimental group at repeated time intervals. ( $F=99.2, p<0.001$ ) which indicates that cryotherapy as an intervention for postoperative pain is effective. This is supported by findings of the true experimental study conducted by Minimini V, Baby P, Chennai, to assess the effectiveness of cryotherapy on pain and swelling among patients subjected to arthroscopic surgery. In the study group a decrease in pain score was noted from the mean pain score of  $8.85 \pm 1.5$  to  $2.50 \pm 0.8$ . Results revealed that, there was significant difference in the mean pain scores in the experimental group after cryotherapy ( $F=19.95, p<0.001$ )<sup>6</sup>.

In the present study the calculated t value ( $t(30)=15.3, P=0.001$ ) is less than  $p<0.05$  which indicates that there is a significant difference in the mean post-interventional pain scores in the experimental and control group. This is supported by the findings of the study conducted by Jantaracharut B, et al to compare the effects of cryotherapy use and nonuse on post-operative pain in patients with broken bones. The experimental group received cold compression for twenty minutes and a pause for one hour continuing for 48hours, except for six hours at night. The result revealed that the patients who received cold compression had less pain score, inflammation, swelling and skin necrosis than those patients who did not receive cold compression. It was statistically significant at levels ( $t=20.3, P=0.04$ ). There was also a statistical significance between other variables at 0.001, 0.01 and 0.05 respectively<sup>7</sup>.

In the present study there was no significant association between the pretest level of pain among postoperative orthopedic surgery patients and selected demographic variables in the experimental and control group. These findings are contradictory to study conducted by Minimini, to assess the effect of effectiveness of cryotherapy on pain and swelling among patients subjected to arthroscopic surgery which showed that there was an association between pain and age at  $p<0.01$  in the second postoperative day during the pretest in the study group. In the control group an association was found between the pain and gender at  $p<0.05$  during the pretest<sup>40</sup>.

## CONCLUSION

Many patients after the orthopedic surgery experience pain and swelling that prolong their hospital stay and return to their normal daily life. Nurses need to be competent with the methods of management of pain and swelling. Cryotherapy during the postoperative period does not cost patients and is effective in reducing pain and swelling. Cryotherapy during the post operative period in orthopedic patients can be considered as routine care and health care professionals can teach the caregivers regarding the cryotherapy so that they could perform it after the discharge in their home settings.

## REFERENCES

1. Pachore, J., Vaidya, S., Thakkar, C., Bhalodia, H., & Wakankar, H. (2013). ISHKS joint registry: A preliminary report. *Indian Journal Of Orthopaedics*, 47(5), 505. <https://doi.org/10.4103/0019-5413.118208>
2. Block, J. (2010). Cold and compression in the management of musculoskeletal injuries and orthopedic operative procedures: a narrative review. *Open Access Journal Of Sports Medicine*, 105. <https://doi.org/10.2147/oajsm.s11102>.
3. McDowell, J., McFarland, E., & Nalli, B. (1994). Use of Cryotherapy for Orthopaedic Patients. *Orthopaedic Nursing*, 13(5), 21-30. doi: 10.1097/00006416-199409000-00006.
4. Tepperman, P., & Devlin, M. (1983). Therapeutic heat and cold. *Postgraduate Medicine*, 73(1), 69-76. <https://doi.org/10.1080/00325481.1983.11698314>.
5. Lessard, L., Scudds, R., Amendola, A., & Vaz, M. (1997). The Efficacy of Cryotherapy Following Arthroscopic Knee Surgery. *Journal Of Orthopaedic & Sports Physical Therapy*, 26(1), 14-22. <https://doi.org/10.2519/jospt.1997.26.1.14>.
6. V, M., Baby, P., & Manjula, A. (2014). Effectiveness of cryotherapy on pain and swelling among patients subjected to arthroscopic surgery. *Journal Of Science*, 4(7), 416-420. <https://doi.org/e-ISSN 2277 - 3290>.
7. Jantaracharut, B., Singchaleem, T., Pungtong, J., Sumachareun, A., Loahawee, P., Pornpatkun, C., & Wongtriratanachai, P. (2016). Comparing the Effects of Cryotherapy Use and non-use on Post-Operative Pain in Patients with Broken Bones. *International Journal Of Evidence-Based Healthcare*, 14(Supplement 1), S11-S12. <https://doi.org/10.1097/01.xeb.0000511629.67572>.