

Effectiveness of Intradialytic Stretching Exercise on Pain due to Muscle Cramps among Patients Undergoing Haemodialysis at a Selected Tertiary Care Hospital Bhubaneswar, Odisha

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Abstract

Among the patients undergoing haemodialysis, complication of muscle cramps, commonly occurs in calf muscles, feet, toes and thigh. Stretching exercises are the best measure to reduce or prevent cramps from occurring during haemodialysis among chronic renal failure patients. In this study to evaluate the effectiveness of intra dialytic stretching exercise on pain due to muscle cramps among haemodialysis patient, randomised controlled clinical trial design was adopted; 162 patients, undergoing dialysis at Pradyumna Bal Memorial Hospital, Bhubaneswar were selected by consecutive sampling technique and according to randomisation table, divided into (1) control group (n=81) receiving only standard institutional protocol with 0.9% normal saline, at the onset of muscle cramps, during haemodialysis and (2) experimental group (n=81) receiving passive intradialytic stretching exercises, at the onset of pain, during haemodialysis for 15 minutes, once per sitting and the same was repeated for 3 such sittings. Pre-test pain score and post-test pain score at the end of each sitting, for both the group was recorded. Statistical findings (independent t-test) revealed that in day 3 post-test mean score of pain due to muscle cramp in experimental group and control group were 1.74 & 4.15 respectively with difference of pre-test and post-test score in experimental group and control group were 7.04 & 4.87 respectively which was found to be statistically significant ($p < 0.05$). After intra dialytic stretching exercise, a significant level of reduction in pain due to muscle cramps was noticed among patients undergoing haemodialysis. Participants felt comfortable and also expressed high level of satisfaction towards administration of stretching exercise.

Kidneys, the vital organ in body system, play a vital role in the maintenance of homeostasis mechanism in human body. Chronic renal failure (CRF) is a common clinical syndrome characterised by decline in glomerular filtration, perturbation of extracellular fluid volume, electrolyte and acid base homeostasis and retention of nitrogenous waste from protein catabolism. CRF results from partial or total loss of renal function. It exists when residual renal function is less than 15 percent of normal. Chronic kidney disease (CKD) limits functional capacity which leads to cardiovascular complications, and endocrine metabolic, musculoskeletal, and other disorders that affect the quality of life.

Dialysis is one of the main replacement therapies in patients with kidney disease. It removes many of the toxins responsible for the uremic syndrome and prolongs survival. However, dialysis treatment

doesn't fully cure the uremia. During dialysis many complications may occur like tiredness, fatigue, hypotension and muscle cramps. Muscle cramps can involve the legs, most commonly in the feet, but can also involve arms and hands, as well as abdominal muscles. It is estimated that 33 to 86 percent of patients receiving haemodialysis experience muscle cramps. Thus, interfering with the muscle cramps and even preventing the occurrence become a major responsibility of the patients. Since nurses take care of haemodialysis patients almost everywhere, it becomes predominantly the nurses' role.

The reasons for cramps during haemodialysis include hypoperfusion, electrolyte imbalance, carnitine depletion etc. and results in calf muscle shortening. The existing pharmacological measures are aimed at correcting these chemical imbalances. Conversely, the non-pharmacological measures mentioned above are employed after the muscle cramps have occurred.

According to the current literature, stretching a muscle prophylactically can reduce the muscle cramps. The most used non-pharmacological therapies are stretching exercise, strengthening exer-

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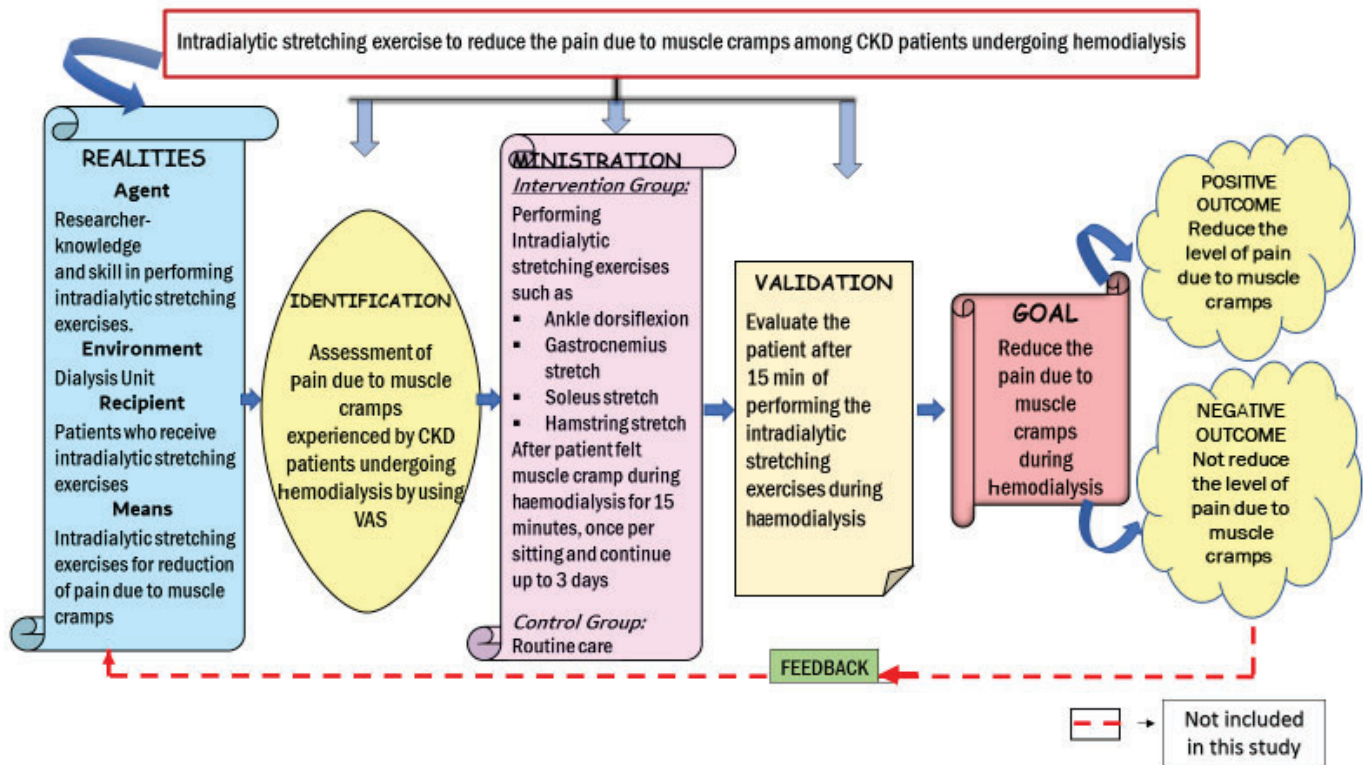


Fig 1: Conceptual framework based on Modified Wiedenbach's Helping Art of Clinical Nursing Theory.

cise and oil massage (Sheeba, 2015). Therapies like flexibility exercises and strengthening exercises improve the physical functioning of the patient. Leg stretch exercises done during the dialysis procedure like quadriceps knee strengthening exercise, hamstring exercise and gluteal strengthening exercise will improve the muscle protein synthesis and breakdown, which helps in determining both strength and overall function of the body.

This study was conceptualised to elucidate the effect of intradialytic stretching exercise on pain due to muscle cramps among patients undergoing haemodialysis.

Objectives

The study was carried out with two objectives.

- To assess the level of pain due to muscle cramps among haemodialysis patient both experimental and control group.
- To evaluate the effectiveness of intra dialytic stretching exercise on pain due to muscle cramps among haemodialysis patient in experimental group.

Hypothesis

There is a significant difference in the level of pain due to muscle cramps among CKD patients receiving intradialytic stretching exercises.

Conceptual framework: Modified Wiedenbach's helping art of clinical nursing theory is used as the conceptual framework to assess the effectiveness of

intradialytic stretching exercises on prevention and reduction of muscle cramps among patients undergoing haemodialysis. The conceptual framework was developed by Ernestine Wiedenbach in 1964 (Fig 1). The theory has two parts: (a) helping art of clinical nursing theory and (b) nursing practice.

Helping art of clinical nursing theory is a prescriptive theory for nursing which describes a desired action and the ways to attain it. It consists of three factors, central purpose, prescription, and realities.

Central purpose: It refers to what the researcher wants to accomplish. It is the overall goal. The central purpose of the study is reduction of level of pain due to muscle cramps after giving intradialytic stretching exercises.

Prescription: It is the plan of care for a patient. It includes the action and the rationale for that action which fulfils the central purpose. In this study intradialytic stretching exercises was used for the treatment group as a procedure. The procedure was done for 15 minutes and the level of pain due to muscle cramps were assessed using the muscle cramp questionnaire chart and the visual analogue scale.

Realities: It refers to the physical, physiological, emotional and spiritual factors that involves in nursing actions.

Review of Literature

A study was conducted to assess the effectiveness

Table 1: Average pain level assessed as the average of pre-test measured at Day 1, Day 2 and Day 3 between experimental and control group

Pre-test VAS score	Group 1 (n=81) f (%)	Group 2 (n=81) f (%)	p value
No pain	0	0	0.245
Mild pain	0	0	
Moderate pain	0	3 (100)	
Severe pain	81 (50.9)	78 (49.1)	

Table 2: Average pain level assessed as the average of pre-test measured at Day 1, Day 2 and Day 3 between experimental and control group

Post-test Pain level	Group 1 (n=81) f (%)	Group 2 (n=81) f (%)	p value
No pain	0	0	<0.001
Mild pain	43 (37.72)	71 (62.28)	
Moderate pain	38 (79.17)	10 (20.83)	
Severe pain	0	0	

of intra-dialytic stretching exercise on reducing muscle cramps among haemodialysis patients at Sri Manakula Vinayagar Medical College and Hospital, Puducherry. Study result showed that in pre-test 27 (38.5%) had moderate level of muscle cramps and 43 (61.4%) of them had severe level of muscle cramps during haemodialysis. In post-test, out of 70 samples 5 (07.1) had no episodes of muscle cramps, 28 (39.9%) had mild level of muscle cramps, 37 (52.8%) them had moderate level of muscle cramps. This study implies that the intra dialytic stretching exercise is an effective intervention to reduce muscle cramps during haemodialysis among haemodialysis patients (Danasu, 2016).

A study was conducted to evaluate the effectiveness of intradialytic stretching exercises on prevention and reduction of muscle cramps among patients undergoing haemodialysis at PSG Hospi-

tals Coimbatore; 60 samples were selected 30 each in intervention and comparison group. On the day of first sitting of haemodialysis, the pre-test score of muscle cramps was assessed by a standardised cramp questionnaire chart and the visual analogue scale. The study result shows that intradialytic stretching exercises helps to prevent and reduce the muscle cramps during haemodialysis (Lekha & Abraham, 2017).

Material and Methods

After getting clearance from Institutional Ethics Committee (IEC), 162 willing patients, between 20-60 years of age undergoing haemodialysis at Pradyumna Bal Memorial Hospital, Bhubaneswar, were selected for the study. Those who were excluded from the study were patients having other chronic disorders (liver disease, Raynaud's disease, peripheral neuropathies, ortho patients), those who were admitted in ICU, those undergoing emergency and first haemodialysis, patients with femoral catheter, those with any lower limb disability and lower limb vascular disorders or body mass index (BMI) <17.0 and patients who received analgesics before undergoing dialysis.

Randomised controlled clinical trial design was adopted; 162 patients were selected by consecutive sampling technique and the patients were randomised using a computer-based randomisation table, in two groups of 81 patients each, as under: Control group (n=81) receiving only standard institutional protocol with 0.9% Normal Saline during haemodialysis, and Experimental group (n=81) receiving passive intradialytic stretching exercises, at the onset of pain, during haemodialysis for a period of 15 minutes, once per sitting and the same repeated for 3 such sittings.

A brief introduction was given to explain the purpose of the study to the patient, so as to get their co-operation. Pre-test VAS score was recorded for each group before commencement of every sitting. Patients of group 1 received only 0.9% normal saline, as per institutional protocol, at the onset of muscle cramps (max 200 ml) during haemodialysis. Whereas, patients of group 2 received the passive intradialytic stretching exercises, at the onset of pain, for 15 mins per sitting comprising of ankle dorsiflexion, gastrocnemius stretching, soleus stretching and hamstring stretching, and the same was repeated for three such sittings.

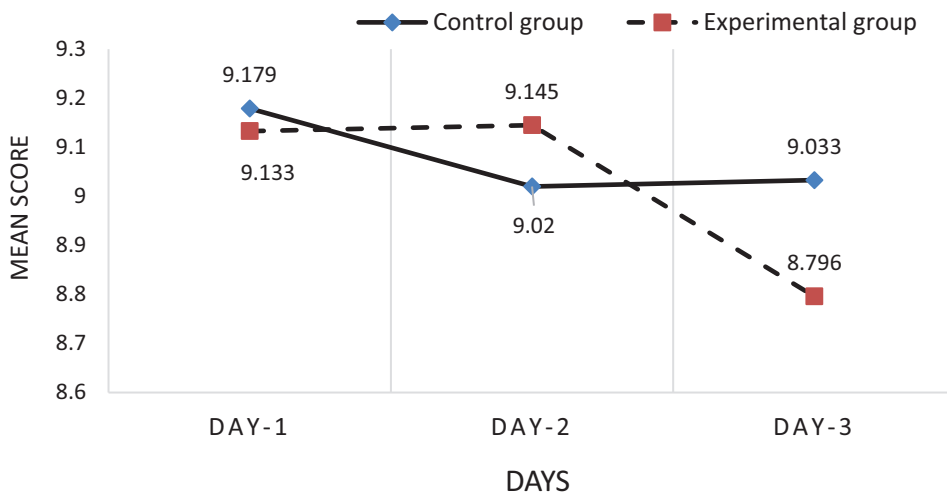


Fig 2: Comparison of mean score of day 1, day 2 & day 3 pre-test pain level in control group and experimental group which is not statistically significant (day 1 p=0.699, day 2 p=0.275 & day 3 p=0.143).

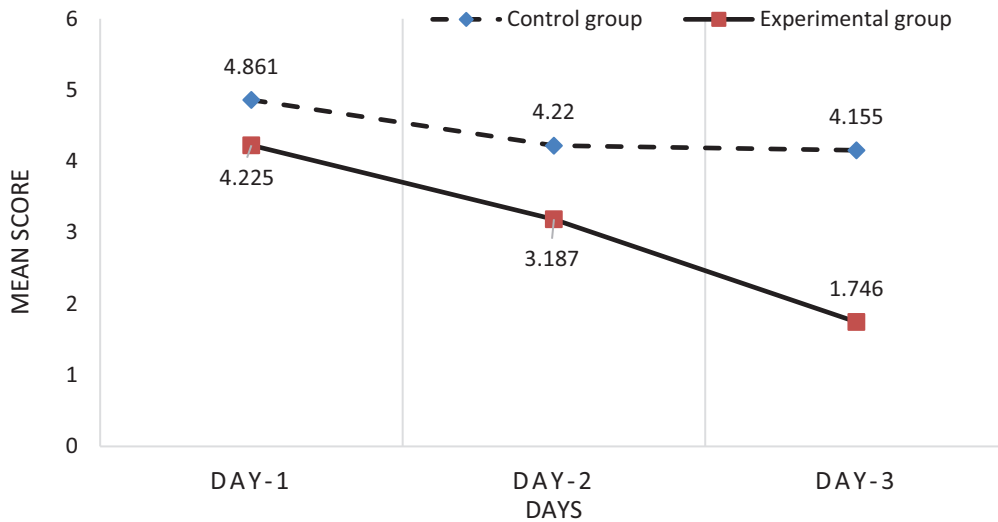


Fig 3: Comparison of Mean score of Day 1, Day 2 & Day 3 post-test pain level in control group and experimental group which is statistically significant (Day 1 $p=0.001$, day 2 $p<0.001$ & day 3 $p<0.001$).

Pre-test pain score was obtained by using Visual analogue scale for each group. While post-test pain score was recorded after the intervention, after each sitting. At the end of the study, the observations were tabulated and statistically analysed using computer-based statistical software STATA with the help of fisher exact, unpaired t-test, paired t-test, ANOVA (single way), as applicable; $p<0.05$ was considered to be statistically significant whereas p value <0.05 was taken as non-significant. p value <0.01 was regarded as highly significant.

Results

Table 1 shows that the difference between the average pain level (VAS score) assessed as the average of pre-test measured at day 1, day 2 and day 3 between experimental and control group was comparable and statistically not significant ($p=0.245$).

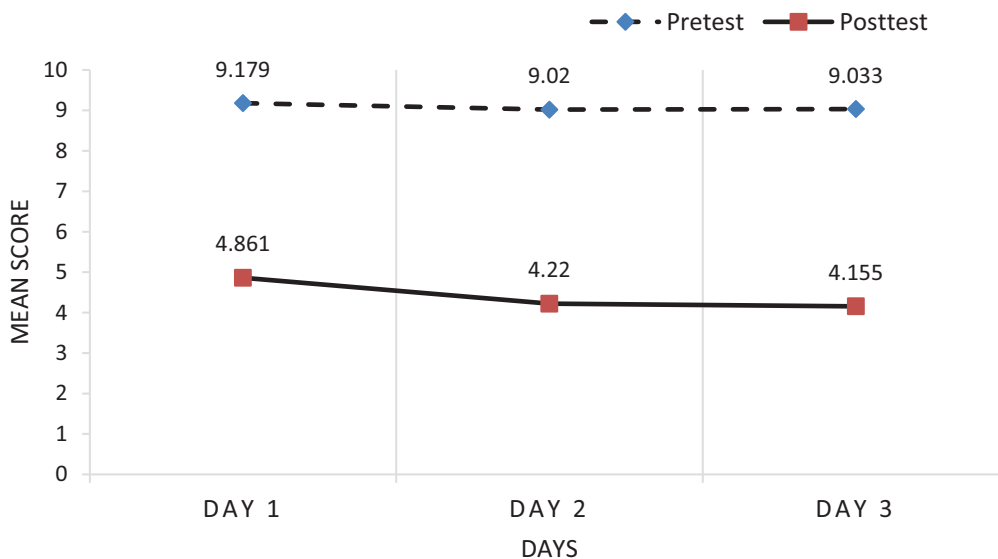


Fig 4: Mean score of pain level due to muscle cramps (day 1, day 2 & day 3) between pre- & post-assessment in control group (day 1 $p<0.001$, day 2 $p<0.001$ & day 3 $p<0.001$) showing that reduction level of pain due to muscle cramp are same for 3 days and statistically significant.

Table 2 shows that the difference between the average pain level (VAS score) assessed as the average of post-test measured at day 1, day 2 and day 3 between experimental and control group was statistically highly significant ($p<0.001$).

Association with socio-demographic and clinical variables.

Also, patient's hours of taking haemodialysis in a sitting had significant association with the levels of muscle cramps among patients undergoing haemodialysis.

- It was inferred that patient's time of muscle cramps during haemodialysis had significant association with the levels of muscle cramps among patients undergoing haemodialysis.
- Other demographic variables had no significant association between the level of muscle cramps among patients undergoing haemodialysis.

Discussion

The aim of the present study was to assess the effectiveness of intradialytic stretching exercise on pain due to muscle cramps among patients undergoing haemodialysis. Visual analogue scale was used to assess the level of muscle cramps.

The findings revealed that during pre-test the

CKD patients on haemodialysis in the interventional group after day 3, the average of maximum 3 (3.70%) was moderate and 78 (96.30%) was severe level of pain due to muscle cramps and none of them had no pain and mild pain. Whereas in the control group, pre-test score after day-3 the average of 81 (100%) was severe level of pain due to muscle cramps and none of them had no pain, mild pain and moderate pain. Here, calculated p value is 0.245 which is not significant as >0.05 (level of significance). It was also revealed that (independent t-test) in day 3, mean pre-test pain level in

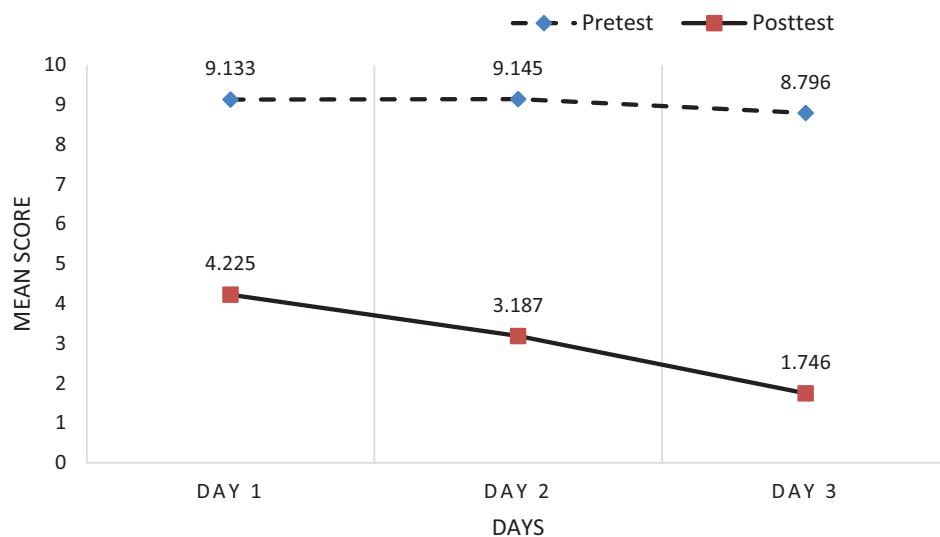


Fig 5: Mean score of pain level due to muscle cramps (day 1, day 2 & day 3) between pre- & post-assessment in experimental group (day 1 $p < 0.001$, day 2 $p < 0.001$ & day 3 $p < 0.001$) showing that reduction level of pain due to muscle cramp is more in day 3 than day 2 and day 1, and statistically significant.

control group and experimental group were 9.033 and 8.796 respectively and not statistically significant ($p = 0.143$, < 0.05) whereas post-test pain level in control group and experimental group were 4.155 and 1.746 respectively which is statistically significant ($p < 0.001$, < 0.05) (Fig 2 & 3).

In pre-test mean score of level of pain due to muscle cramp was almost same in control and experimental group. Reduction of mean score of level of pain due to muscle cramp in day 1 was almost same for experimental and control group. Whereas, day 2 and day 3 reduction of level of pain due to muscle cramp were more in experimental group than in control group.

Pain-related score during pre-assessment and post-assessment were compared separately in control group and experimental group. The paired t-test results revealed that on day 3, mean pain score during pre-assessment and post-assessment were 9.03 & 4.15 respectively observed in control group which was found to be statistically significant. Similarly, the pain score during pre-assessment & post-assessment were 8.80 & 1.75 respectively in experimental group and also statistically significant with a substantial difference (Fig 4 & 5).

Mean score of level of pain due to muscle cramp in day 2 and day 3 were substantially different between pre-assessment and post-assessment in experimental group than in the control group. Hence, it can be inferred that there was no much pain reduction in the control group as in interventional group. So, intradialytic stretching exercise is effective than routine care for reduction of pain due to muscle cramp of patient undergoing haemodialysis.

The main finding of our study is that passive intradialytic stretching exercises had a significant impact in reducing the pain level of muscle cramps in patients undergoing haemodialysis, as indicated by the difference in the VAS score between the two groups.

Nursing Implications

Nursing Practice

- Intradialytic stretching exercises can be adapted as a procedure to the patients undergoing haemodialysis.

- Nurses can introduce the evidenced-based practice of doing this stretching exercise during the haemodialysis session.

- Nurses must realise the patient's comfort during haemodialysis thus help to reduce the muscle cramps experienced by the patients.

- Nurses can introduce practice stretching exercise as a complementary therapy.

Nursing Education

- Nursing students and staff nurses can be taught about the intradialytic stretching exercises for the reduction of muscle cramps.

Nursing Administration

- Policies and the procedure manual of intradialytic stretching exercises can be developed based on the study findings by incorporating the stretching exercises into the procedure.

- Nurse managers can educate the medical surgical nurses regarding the intradialytic stretching exercises through in-service education programmes and take up initiatives in planning and implementation of non-pharmacological therapies along with the routine therapy.

Nursing Research

- Nurse researchers can conduct studies to verify the scientific rationale and the physiology behind the effect of intradialytic stretching exercises on level of muscle cramps.

- The study findings can be kept as baseline data and further research can be conducted in same setting.

- Guidelines for the procedure of intradialytic stretching exercises can be prepared.

Recommendation

- Training can be provided to the staff nurses

regarding passive intradialytic stretching exercises.

- Structured teaching programme on active intradialytic stretching exercises can be provided to the patients undergoing haemodialysis.
- The study can be repeated by performing massage therapy on reduction of muscle cramps.
- A similar study can be conducted by comparing the resistance exercises and the stretching exercises on reduction of muscle cramps.
- A study can be done to assess the effect of ultrafiltration rate on the level of muscle cramps.
- A cohort study can be done to understand the effect of long-term stretching exercises on prevention of muscle cramps.

Conclusion

Most of the patients undergoing haemodialysis had significant level of pain due to muscle cramps. After stretching exercise session, it was found that there had been a significant level of reduction in level of pain due to muscle cramps. Participants felt comfortable and also expressed high level of satisfaction towards administration of stretching exercise. Intradialytic stretching exercise is an effective and simple strategy to reduce pain due to muscle cramps among patients undergoing haemodialysis.

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