

**EFFECTIVENESS OF INTRA DIALYTIC STRETCHING EXERCISE
ON MUSCLE CRAMPS AMONG HEMODIALYSIS PATIENTS AT
SREE MOOKAMBIKA MEDICAL COLLEGE HOSPITAL,
KULASEKHARAM, KANYAKUMARI DISTRICT.**



**A DISSERTATION SUBMITTED TO THE TAMILNADU
DR.M.G.R. MEDICAL UNIVERSITY CHENNAI, IN
PARTIAL FULFILMENT FOR THE DEGREE OF
MASTER OF SCIENCE IN NURSING
OCTOBER 2015**

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Internal Examiner

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BONAFIDE CERTIFICATE

This is to certify that the dissertation entitled “**A study to assess the effectiveness of intra Dialytic Stretching Exercise on muscle cramps among Hemodialysis patients at Sree Mookambika Medical College Hospital at Kulasekharam in Kanyakumari District**” is a bonafide research work done by **Mrs.Sahaya Hestrin, II year MSc (N)**, Sree Mookambika College of Nursing, Kulasekharam under the guidance of **Prof Mrs.Ajitha Ratnam, M.Sc.(N), MBA, Ph.D (N)** HOD Medical and Surgical Nursing in partial fulfillment of the requirements for the Degree of Master of Science in Nursing under Tamilnadu Dr. M.G.R Medical University.

Place : Kulasekharam
Date : 10.08.2015

Principal
Sree Mookambika College of Nursing,
Kulasekharam.

DECLARATION

I hereby declare that the present dissertation titled “**A study to assess the effectiveness of intra Dialytic Stretching Exercise on Muscle cramps among Hemodialysis patients at Sree Mookambika Medical College Hospital at Kulasekharam in Kanyakumari District**” the outcome of the original research undertaken and carried out by me under the guidance of **Prof Mrs.Ajitha Ratnam, M.Sc.(N), MBA, Ph.D. (N)** HOD, Medical and Surgical Nursing. I also declare that the material of this has not formed in anyway, the basis for the award of any degree or diploma in this university or any universities.

Place: Kulasekharam

Date: 10.08.2015

Mrs. Sahaya Hestrin,S.

II year MSc (N)

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Investigator

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Abstract

Muscle cramp is a widespread problem in the dialysis population and it primarily affects the lower limbs of the Hemodialysis patients. Patients undergoing haemodialysis are susceptible to sudden painful, involuntary contractions of skeletal muscle, commonly known as cramps. The exact aetiology of cramps in dialysis patients is unclear. It is one of the most frequent complications of Hemodialysis. Exercise may have a beneficial effect on a number of factors implicated in the aetiology of hemodialysis associated cramping. Exercise can attenuate vasoconstriction in muscle caused by activation of the sympathetic nerves, and it is also known to improve oxygen delivery and utilisation. The main objective of the study was to determine the effectiveness of intra dialytic stretching exercise in reducing muscle cramps among hemodialysis patients in experimental group. The research design adopted was quasi experimental with two group pre test post test design, purposive sampling technique was followed to obtain a sample of 60 Hemodialysis patients (30 Hemodialysis Patient in experimental groups and 30 in control group) Pre test and post test assessment was done by using muscle cramps assessment tool. Intra dialytic stretching exercise was provided for 15 minutes during the second hour of dialysis daily for 2 sessions per week to the experimental group where as control group was not given any intervention. Post test was conducted after 30 days for both experimental and control group. The study reveals that level of muscle cramp was reduced in experimental group after intra dialytic stretching exercise than in the control group. The 't' value of difference of comparison mean of muscle cramps tabulated was found to be $t = 36.25^*$, $df = 58$, $P < 0.05$. The study also shows that there is an association between level of muscle cramps and age. The conclusion of the study shows that intra dialytic stretching exercise is found to be an effective non pharmacological therapy in reducing muscle cramps level.

Key words : Intra dialytic stretching exercise, muscle cramps Hemodialysis patients.

CHAPTER I

Introduction

“Lack of activity destroys the good condition of every human being while movement and methodical physical exercise save it and preserve it”

PLATO

Chronic kidney disease (CKD) is a worldwide public health problem, a social calamity and an economic catastrophe. It is an important non communicable disease that affects the world population including India. The prevalence of End Stage Renal Disease (ESRD) is rising out throughout the developed and developing countries mainly due to Diabetes and Hypertension.

In the United States around 153 per million population of Diabetes leading to CKD and Hypertension accounting for 99 per million population and Glomerulonephritis accounts for 23.7 per million populations. Cardiovascular Disease is also an important cause. About 28 % of patient living with stage 3 CKD is neither Diabetic nor Hypertensive and they are older than 65 years.

The potential outcome of chronic kidney Disease (CKD) is End Stage Renal Disease (ESRD), requiring costly renal replacement therapy in the form of dialysis or transplantation. Over 2 million people now require renal replacement therapy to sustain life worldwide.

(United States Renal Data System Annual Data Report, 2010)

Dialysis removes many of the toxins responsible for the uremic syndrome and prolongs survival. However the dialysis does not fully correct the uraemia and may be associated with treatment related complications. These complications prevent patients from attaining a state of full health and interfere many aspects of life.

According to Murtagh FE.et al, 2007, the most important symptoms of hemodialysis patients are tiredness(71%), pruritis(55%), Dyspnoea (35%), constipation (53%), anorexia(49%), pain(47%), sleep disturbance (44%), nausea (33%), restless legs (30%) and depression (27%).

Muscle cramps occur frequently in patients receiving dialysis. Muscle cramps can involve the legs(posterior tibial area), and most commonly in the feet, but can also involve arms and hands, as well as abdominal muscles. It is estimated that 33% to 86% of patients receiving dialysis have experienced cramps.

(Holley, 2011; Kobrin&Berns, 2007)

According to Paul Kellerman, 2012 Cramps occur in 1/3 to 2/3 of all dialysis patients and they experience cramps in the lower extremities, but sometimes in the hands, arms and abdominal muscles as well.

Holley 2011, reported that muscle cramps begin with fasciculation's or muscle twitches and are felt to be related to nerve conduction rather than the muscles themselves. Numerous factors contribute to muscle cramps in patients with CKD receiving dialysis and include volume contraction, hypotension, changes in plasma osmolality, hyponatremia, tissue hypoxia, hypomagnesaemia, deficiency of carnitine and elevated serum leptin. Low concentrations of sodium in the dialysate bath and

increased ultra filtration required to remove excess fluid are factors related to the dialysis procedure itself, which increase the risk of muscle cramps.

According to James.O.Burton, exercise may have a beneficial effect on a number of factors implicated in the aetiology of hemodialysis associated cramping. Exercise can attenuate vasoconstriction in muscle caused by activation of the sympathetic nerves, and it is also known to improve oxygen delivery and utilisation. This reduces the incidence of muscle hypoxia. In addition, regular exercise can help to stabilise blood pressure, reducing periods of hypotension which are also associated with episodes of muscle cramping

Muscle wasting, abnormalities in muscle function, are common in patients with End Stage Renal Disease. Muscle wasting is a strong risk factor for mortality in End Stage Renal Disease patients. Exercise is one of the possible preventive manoeuvres to reduce muscle protein loss and maintain muscle function. Recently, many studies have shown the importance of exercise or regular physical activity to prevent muscle wasting in End Stage Renal Disease patients.

It is well-known that muscle strength is one of the most important determinants of physical function and an essential point to maintain activities of daily living in patients undergoing hemodialysis. Therefore an intra dialytic low intensity progressive strength training programme is safe and effective among hemodialysis patients.

Background Of The Study

Alice .M. 2011, founded that numerous strategies can be employed in order to prevent cramps in patients receiving dialysis. The most common factors related to the

hemodialysis procedure itself are volume contraction and hyponatremia. Local massage of the affected muscle and the application of moist heat may provide some comfort. Other low-risk strategies include performing stretching exercises before dialysis, performing mild exercise such as riding a stationary bicycle during dialysis or prior to bedtime, and keeping bed covers loose and not tucked in to prevent cramps. Local heat (including showers or baths) or ice, massage, walking or leg jiggling followed by leg elevation, are other methods reported to help to relieve muscle cramps.

Jeffray et al, 2011, conducted a study among hemodialysis patients and he founded that muscle cramps are a common complication of hemodialysis treatments, occurring in 33 to 86 percent of patients. They often result in early termination of a hemodialysis session and are therefore a significant cause of under dialysis. Changes in plasma osmolality and extra cellular fluid volume may cause muscle cramps. Minimizing intra dialytic weight gains, increasing dialysis treatments time to reduce ultra filtration rate, using sodium modelling and avoid hypotension may reduce cramps during dialysis. He also founded that cramps during dialysis treatments can be treated with administration of hypertonic saline solution or dextrose and local heat, massage of the affected muscle.

Jolin L.T, et al, 2010, conducted study to assess the intra dialytic low strength training on functional capacity in adult hemodialysis patients. Fifty participants receiving long-term hemodialysis were randomized to intra-dialytic low-intensity strength training or stretching (attention-control) exercises twice weekly for a total of 48 exercise sessions. Participants in the strength training group exercised their lower body. Exercises included seated right/left knee extension with dorsi /plantar flexion

(quadriceps muscle), seated leg curl with both legs keeping the heels pressed firmly against a chair while rolling the legs in and out(hamstrings), semi recumbent right/left inner leg raises (hip adductors), and semi recumbent dorsi/plantar flexion with straight legs (tibialis anterior ,gastrocnemius and soleus muscles). The Study results revealed that Intra-dialytic, low-intensity progressive strength training was safe and effective among maintenance dialysis patients.

Hannah ML Young et al (2012) reported that Patients undergoing hemodialysis (HD) are susceptible to sudden painful, involuntary contractions of skeletal muscle, commonly known as cramps.Muscle cramping is a widespread problem in the dialysis population and primarily affects the lower limbs.Exercise may have a beneficial effect on a number of factors implicated in the aetiology of hemodialysis associated cramping. Acutely, exercise can attenuate vasoconstriction in muscle caused by activation of the sympathetic nerves, and it is also known to improve oxygen delivery and utilisation. This reduces the incidence of muscle hypoxia.Exercising within the first two hours of dialysis may lessen the severity of ‘end-of-treatment’ cramps. Static stretching may also be of benefit. Stretches should be performed in a weight-bearing position for ten to 20 seconds, and repeated three to five times. Stretching in a weight-bearing position is difficult during dialysis; the use of towels can help to improve the quality of the stretches. In addition, elevation, massage and heat application may also alleviate cramping.

(British Journal of Renal Medicine, 2012).

Magdha Mohamed et al,(2007) conducted a study to determine the effect of a stretching exercises protocols on reduction of leg cramp during hemodialysis among chronic renal failure patients.60participants were participated. All the patients

underwent 12 sessions of intra dialytic stretching exercise program mainly at the lower extremities. The result was there was a high significance difference in reduction of muscle cramps before and after exercise and they concluded that stretching exercise is beneficial among hemodialysis patients

Need For The Study

Chronic Kidney Disease is a worldwide public health problem .Overall 3.7 million people in the United States were treated every year through hemodialysis. (AHRQ Agency for health care research 2012), and in UK around 108 million per population people receiving Hemodialysis (UK renal registry 16 th annual report).

According to Keith et al 2013, about 28, 000 North American patients living with CKD at different stages of the disease and they are undergoing Hemodialysis as a renal replacement therapy.

FRESENIUS MEDICAL CARE report of ESRD patients 2011,It says that the number of patients being treated for ESRD globally was estimated to be 2,786,000 at the end of 2011. Of these 2,786,000 ESRD patients, approximately 2,164,000 were undergoing dialysis treatment (Hemodialysis (HD) or Peritoneal dialysis (PD)) and around 622,000 people were living with kidney transplant treatments. And it was estimated that the great majority of the 1,929,000 patients were treated in 31,100 centres worldwide with an average of 62 patients per centre. Further analysis reveals that 40% of dialysis centres lie within the public sector or belong to healthcare organisations, while the remaining 60% are private.

Nearly Ten percent of India's 1.24 billion people suffer from chronic kidney disease (CKD). Diabetes is the primary cause of CKD in India. The condition

accounts for 30 percent of all Chronic Kidney Disease cases. Chronic Kidney Disease patients in India tend to be much younger on average than in other countries. Patients with end stage renal disease (also known as Stage V Chronic Kidney Disease) are usually 45 – 50 years old, as opposed to older than 60 in the West. As a result, Chronic Kidney Disease patients in India typically need more comprehensive and longer care regimens than their counterparts in other countries. Prevalence of the disease also varies by region in India. Urban areas have much higher rates than rural areas, and Northern India has higher rates than Southern India. For example, New Delhi had a Chronic Kidney Disease rate of more than 40 percent in 2013, while Mysore and Bangalore had rates of about 4 percent.

(India's Dialysis Market, July 2013)

According to UmeshKanna, India have 1000 dialysis centres and 9000 Dialysis machines. In that around 54,000 – 60,000 patients getting treated with Dialysis. Around 1200 Nephrologists working in the Kidney Transplant centres throughout India.

According to Fiona Blyton, (2012), around 76 % of people experiencing night time cramps specially two hours of falling asleep or before sleep and that was really painful and affects their sleep pattern. Almost all patients with Chronic Kidney Disease complaints of muscle cramps usually of lower extremities mainly in the calf muscle during Dialysis. They are managed with temporarily stopping the ultra filtration till the cramps stopped.

To get relieve from an established cramps one must passively stretch the contracting muscle. Prophylactic stretching of the particular muscle can also prevent attacks.

The hemodialysis department of SreeMookambika Medical College Hospital is presently dealing with 95 patients undergoing Maintenance Hemodialysis. In the beginning they had only 3 sessions of dialysis therapy per day. Now due to increases in Chronic Kidney Disease patients they are taking around 5 sessions of therapy. In each session they are treating 10 patients. In that more than 75% of people undergoing weekly twice dialysis treatment and most of them complaints with intradialytic muscle cramps mainly in the lower extremities and the Nurses spending much of their time in helping with the patients and sometimes the patients getting relief with minimizing the Ultra Filtration Volume and other measures .

In order to get relieve from an established cramps one must passively stretch the contracting muscle. Prophylactic stretching of the particular muscle can also prevent attacks. (HANNAH. ML, 2012).

Thus the researcher decided to provide passive calf muscle stretching exercises prophylatically during the hemodialysis period to relieve or to reduce the muscle cramps during hemodialysis sessions.

Statement Of Problem:

“A Quasi Experimental study to assess the effectiveness of intradialytic stretching exercise on muscle cramps among patients undergoing Hemodialysis at SreeMookambika Medical College Hospital, Kulasekaram, Kanyakumari District

Objectives

1. To assess the level of muscle cramps among patients who are undergoing hemodialysis.
2. To assess the effectiveness of intra dialytic stretching exercise on reducing the muscle cramps among patients undergoing hemodialysis in experimental group.
3. To find out the association between level of muscle cramps and selected demographic variables such as age, sex, duration of hemodialysis, frequency, practice of physical exercise clinical variables such as serum creatinine level, pulse pressure, and weight gain.

Hypotheses

- H1 - There will be a significant reduction of muscle cramps among clients after Intra dialytic exercise administration at 0.05 level of significance
- H2- There will be association between muscle cramps and selected demographic variables such as age, sex, duration of hemodialysis, frequency, practice of physical exercise, and clinical variables such as serum creatinine level, pulse pressure, and weight gain.

Operational definition

Effectiveness: In this study effectiveness refers to the outcome of the patients experiencing muscle cramps after administration of stretching exercises as measured by muscle cramps assessment tool and symptom assessment checklist.

Stretching exercise: It refers to the exercises performed by the investigator for the gastrocnemeous and soleus muscles of the patient for 15 minutes during the second hour of hemodialysis. The steps involved are,

Step 1: Flex the toes up ward: In a normal sleeping position with the patient's knees slightly bent and the toes pointing down shortens the calf muscles, making them prone to contraction. Flex and point the toes, holding each position for about 5 seconds. Repeat for 30 seconds to 1 minute

Step 2: Massaging the calf muscle: Sit with cramped leg crossed over the other thigh and massage the muscle gently for 5 minutes.

Step 3: Hip and knee flexion and extension: In a normal sleeping position, flex and extend the knee joint for about 5 minutes.

Step 4: Seated knee extension: The patient will sit on the bed and the back of the patient should be in straight, he should keep the hands over the thighs. With this position the patient should slowly raise the leg and keep it for few seconds and bring it to normal position. Repeat this for 15 times.

Step 5: With the legs extended, the nurse should do gentle massage under the feet with her palms in a rotation manner from the top to the heel for about 2-5 minutes

Muscle cramps: In this study muscle cramps refers to the painful involuntary spasm of the calf muscles of patients during hemodialysis.

Assumption

The study assumes that,

1. Most of the patients undergoing hemodialysis will have muscle cramps.
2. The administration of stretching exercise will be beneficial to the patients experiencing muscle cramps during dialysis.

Variables**Dependent variable**

Hemodialysis patients experiencing muscle cramps

Independent variable:

Intra Dialytic Stretching exercises

Delimitation

1. Study is delimited to the hemodialysis patients experiencing muscle cramps in Sree Mookambika Medical College Hospital ,Kulasekharam.
2. Study is delimited to who are willing to participate in the study.

Ethical clearance

The proposed study was conducted after the approval of the college research and ethical clearance committee. The permission to conduct study was obtained from the Nephrology department of Sree Mookambika Medical College Hospital and director of the institution and Assurance of confidentiality was given to the subject and oral consent was taken.

Conceptual framework

The conceptual frame work adopted for the study is based on Lydia E Hall's core, care and cure model (1994). She considered a basic philosophy of nursing upon which the nurse theorist; Lydia E. Hall is unique in that her benefits in nursing were demonstrated in practice. Hall presented her theory of nursing visually by drawing

three interlocking circle i.e. core, care and cure. The three aspects are interrelated and influenced by each other. Nursing has major role in three aspects.

Core:

Core circle of patient care is based on the concept that patient looks at and explore feeling regarding his or her current health status and potential changes. I.e. core circle deals with patient problems. In the present study core part deals with the factors that influencing muscle cramps such as age, sex, duration of hemodialysis, practice of physical exercise, frequency of dialysis, and clinical variables such as serum creatinine level, pulse pressure, weight gain.

Care:

Care circle present the nurturing components i.e. the concept of mothering (care, comfort of the patient) and provide for teaching learning activities. In this study care circle includes the administration of stretching exercise to reduce the muscle cramps during dialysis.

Cure:

Cure circle of patient care is the evaluation of the pathological and therapeutic science applied by the health team members. In this study, cure part deals with response of care provider for the study subjects by the researcher i.e. reduction of muscle cramps.

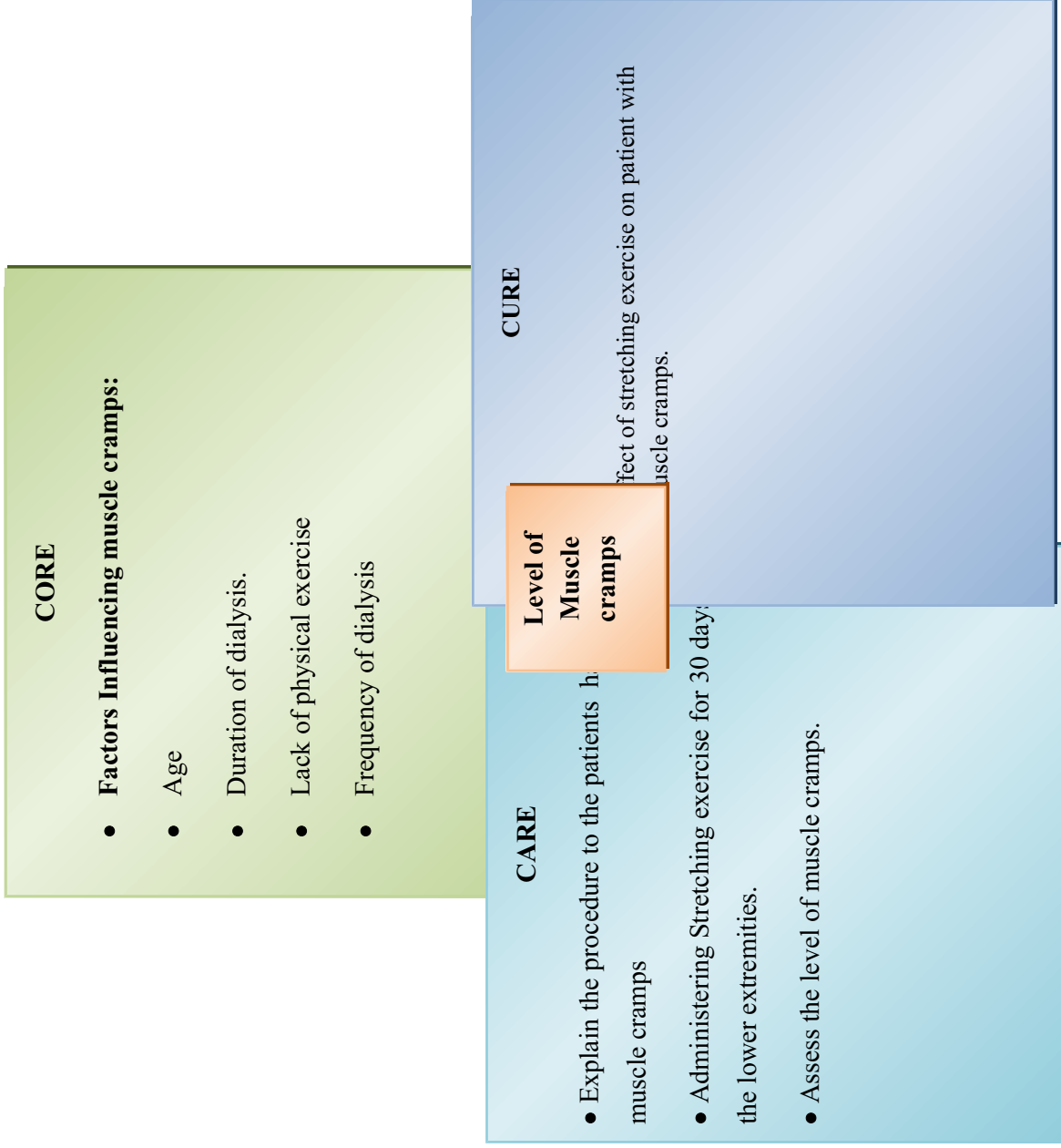


Figure: 1: Lydia E Hall's Core, Care Cure and Model (1994)

CHAPTER II

Review Of Literature

Review of literature is an essential part of any research study. It familiarizes the investigator with previous investigation related to ones field of interest and the various methods and procedures, which can be pursued. It also provides an opportunity to locate related information of interest. Thus it offers general guidelines for the execution of the research studies. A survey of literature thus becomes the vital part in any research of endeavour. It helps to lay the foundation for a study and also plays a role.

This chapter is discussed into the following headings.

1. Studies related to prevalence of muscle cramps
2. Studies related to stretching exercise.
3. Studies related to effectiveness of stretching exercises during hemodialysis.

Studies Related To Prevalence Of Muscle Cramps

Abdulla A.J et al, (1999), conducted a study to determine the prevalence of leg cramps in elderly outpatients and their association with any underlying diseases. They conducted a cross-sectional study using an in-depth questionnaire. A total of 365 patients aged 65 years and over (mean 78.5 years) were participated in this study. They found that the prevalence of leg cramps was 50% and Cramps were commoner in females (56%) than in males (40%). Also they reported that cramps were most

prevalent at night (62%). Out of them 20% had been suffering with cramps for more than 10 years, whereas only 9% of patients reported them first starting within the last six months. Only 73 (40%) sufferers had informed their practitioner; of these, 39 (53%) received treatment. In that 26 gained benefit. They concluded that leg cramps were strongly associated with [peripheral vascular disease](#) (odds ratio 2.9, 95% CI 1.89-4.55, $p < 0.00001$), [arthritis](#) (odds ratio 2.26, 95% CI 1.48-3.45, $p = 0.0001$) and female gender (odds ratio 1.96, 95% CI 1.28-3.03, $p = 0.002$). [Heart failure](#), [hypertension](#), [diabetes mellitus](#) and stroke were not significant.

Brass E Pet al, 2000, conducted a study to describe that Peripheral arterial disease is not associated with an increased prevalence of intradialytic cramps in patients on maintenance hemodialysis 122 patients from two dialysis centres were studied. The presence of PAD was determined by measurement of the ankle-brachial index (ABI) in the lower extremities of patients pre- and post dialysis. The experience of intradialytic cramps was assessed using patient history and review of medical records. The results shows PAD defined as a pre dialysis $ABI < \text{or} = 0.90$ had an overall prevalence of 16.4% among patients studied. The prevalence of PAD was age-dependent, reaching 37.5% in patients 80-89 years old. Intradialytic muscle cramps were common, with 52.1% of patients reporting cramps within the previous two months, but there was no relationship between cramps during dialysis and PAD ($p > 0.05$). In conclusion they founded that PAD was common in hemodialysis patients, but there was no association between the presence of PAD and the prevalence of intradialytic muscle cramps.

[Anupama YJ](#), [Uma G](#) , 2007, conducted a study to assess the prevalence of chronic kidney diseases among adults in a rural community in south India. Door-to-door

screening of 2091 people aged 18 and above was carried out. Demographic and anthropometric data were obtained, urine was analyzed for protein by dipstick and serum creatinine was measured in all participants. Glomerular filtration rate was estimated (eGFR) using the 4-variable modification of diet in renal disease (MDRD) equation and Cockcroft-Gault equation corrected to the body surface area (CG-BSA). The total number of subjects studied was 2091. Mean age was 39.88 ± 15.87 years. 45.57% were males. The prevalence of proteinuria was 2.8%. CKD was seen in 131 (6.3%) subjects when GFR was estimated by MDRD equation. The prevalence of CKD was 16.54% by the CG-BSA method. There was a statistically significant relationship of CKD with gender, advancing age, abdominal obesity, smoking, presence of diabetes and hypertension. It was concluded that the prevalence of CKD is higher compared to the previous studies from rural India and is comparable to that in the studies from the urban Indian populations.

Joanna C. Korevaar, et al, 2007, conducted a study to find out disturbed mineral metabolism is associated with muscle and skin complaints of dialysis patients. They included 1469 consecutive patients who started hemodialysis or peritoneal dialysis between 1997 and 2004. Muscle pain, cramps and itching (pruritus) and dry (xerosis) skin were repeatedly measured using the Kidney Disease Quality of Life-Short Form questionnaire. Odds ratios (OR) for the risk of complaints over time were calculated by generalized estimating equations (GEE) models. The results founded were, the mean age was 59 ± 15 years, 61% of the patients were male and 63% were on hemodialysis. At baseline >65% of the patients had muscle and skin complaints. The risk of muscle pain was increased in patients with hyperphosphataemia (95% confidence interval (CI): 1.1). PTH concentrations below the target range were associated with lower risk of cramps (95% CI: 0.6–0.9). They

concluded that disturbed mineral metabolism according to the K/DOQI guideline is associated with more muscle and skin complaints in dialysis patients. These findings emphasize the importance of keeping mineral metabolism in dialysis patients in tight control.

Jungers P et al, 2010, conducted prospective epidemiologic study to assess age and gender related incidence of chronic renal failure patients in French urban area. The study participants were adult patients newly identified as having chronic renal failure defined by serum creatinine (Scr) \geq 200 $\mu\text{mol/l}$, with the cooperation of all nephrology and dialysis units in the Ile de France district (10,660,000 inhabitants) during a 1-year period. The results showed that 2775 patients (1780 males, 995 females) were referred with Scr \geq 200 $\mu\text{mol/l}$ between July 1991 and June 1992, an overall incidence of 260/million population. 847 had advanced renal failure (Scr \geq 500 $\mu\text{mol/l}$) and 541 patients (19.5%) were \geq 75 years of age. The age-related incidence was 92, 264, 523 and 619/million population in the age groups 20-39, 40-59, 60-74 and \geq 75 years old, respectively. The annual incidence was twice as high in males than in females up to 75 years and three times as high in patients \geq 75 years (1124 vs 356/million population). Based on the proportion of patients reaching end-stage renal failure within one year of referral, the minimal estimation of the need for supportive therapy is 81/million/year. It was concluded that in a large French urban area an incidence of 260 patients per million populations annually referred to nephrology units for chronic renal failure with a marked preponderance of males and a dramatic increase of incidence with age in both genders.

Howe RC, et al, 2011 conducted a study on analysis of tonic muscle activity and muscle cramps during hemodialysis. Forty-six complete dialysis treatment sessions were studied. Electromyography (EMG) activity was recorded from a leg muscle in patients who cramped and control patients who did not cramp. EMG was analyzed by a minicomputer for each minute of recording time. Results indicated the mean muscle cramp latency from start of dialysis was 248 minutes. Average muscle cramp was 10 minutes in duration and took three minutes to develop and seven minutes to fully dissipate. Tonic EMG activity in patients with muscle cramps showed a continued increase throughout the latter part of dialysis whereas the control patients showed a continual decline. The results suggest that the latent increase in EMG activity may be causally related to muscle cramps and may be a useful predictor as to the onset of muscle cramps during hemodialysis.

Ajay.K.Singh, et al, 2013, conducted a study to find out the epidemiology and risk factors of CKD in India. They cross sectionally screened 6120 Indian subjects from 13 academic and private medical centres all over India. They obtained Personal and medical history through a specifically designed questionnaire. Blood and urine samples were collected. The total cohort included in this analysis was 5588 subjects. The mean \pm SD age of all participants was 45.22 ± 15.2 years (range 18-98 years and 55.1% were males and 44.9% were females. The overall prevalence of CKD in the SEEKIndia cohort was 17.2% with a mean GFR of 84.27 ± 76.46 versus 116.94 ± 44.65 mL/min/1.73 m² in nonCKD group while 79.5% in the CKD group had proteinuria. Prevalence of CKD stages 1, 2, 3, 4 and 5 was 7%, 4.3%, 4.3%, 0.8% and 0.8%, respectively. They concluded that the prevalence of CKD was to be 17.2% with 6% have CKD stage 3 or worse. They also concluded that. It should be stressed to all primary taking care of hypertensive and diabetic patients should be

screened for early kidney damage. Early intervention may retard the progression of kidney disease.

Studies Related To Stretching exercises

Rodney, 1998, conducted a study to investigate the effects of ankle dorsi flexion range and pre exercise calf muscle stretching on risk of selected injuries in 1093 males. Prior to training, ankle dorsi flexion range was measured and recruits were allocated to stretch and control group using quasi random procedure. Survival analysis indicate that ankle dorsi flexion range was a strong predictor for injury, ($p = 0.03$). He strongly concluded that stretching prior to exercise will reduce the risk of injuries.

Benedict.F. Digiovanni, et al, 2003, conducted a study regarding tissue specific plantar stretching exercise to reduce chronic heel pain. 101 patients who had chronic proximal plantar fasciculitis for a duration of at least 10 months were analyzed into one of two treatment groups. All patients received pre fabricated soft insoles and a three week course of celecoxib and they all viewed educational video on plantar fasciculitis. All patients completed the pain subscale of the foot function index and subject relevant outcomes survey that incorporated generic and condition specific outcome measures related to pain function. The patients were reviewed after 8 weeks. The pain subscale scores of the foot function index showed significantly better results for the patients managed with the plantar fascia stretching program with respect to item 1. ($P = 0.02$) and item 2 ($P = 0.06$). Analysis revealed significant difference with respect to pain, activity limitation and patient satisfaction with greater improvement seen in the group managed with the plantar fascia stretching program.

Joannes.M.et al, (2013), conducted a study to assess the effect of Stretching before sleep reduces the frequency and severity of nocturnal leg cramps in older adults. The study design was a randomised trial with concealed allocation and intention-to-treat analysis. Study participants were eighty adults aged over 55 years with nocturnal leg cramps. The experimental group performed stretches of the calf and hamstring muscles nightly, immediately before going to sleep, for six weeks. The control group performed no specific stretching exercises. Both groups continued other usual activities .Participants recorded the frequency of nocturnal leg cramps in a daily diary and the severity of the pain associated with nocturnal leg cramps on a 10-cm visual analogue scale. Adverse events were also recorded. After six weeks, the frequency of nocturnal leg cramps decreased significantly more in the experimental group, mean difference 1.2 cramps per night (95% CI 0.6 to 1.8). The severity of the nocturnal leg cramps had also decreased significantly more in the experimental group than in the control group, mean difference 1.3 cm (95% CI 0.9 to 1.7) on the 10-cm visual analogue scale. They concluded that nightly stretching before going to sleep reduces the frequency and severity of nocturnal leg cramps in older adults.

Blyton F.et al, 2013, conducted a study to assess the effectiveness of non drug therapies for lower limb muscle cramps. They searched the samples having cramps, spasm, contractures. Totally 100 patients having cramps, spasm and contractures were selected and all participants were in the age of 60 years or over and had received a prescription from their general practitioner of quinine for night time cramps in the preceding three months. Fifty participants were advised to complete lean-to-wall calf muscle stretching held for 10 seconds, three times per day. Other fifties are advised to continue only quinine. After 12 weeks, the frequency of cramps was analyzed by using the 't' test. There was statistically significant difference in cramp frequency

between groups. No "significant" adverse effect was reported. Finally the authors concluded that there is an urgent need to carefully evaluate many of the commonly recommended and emerging non-drug therapies in treating muscle cramps.

Studies Related to Effectiveness OF Stretching Exercise During Dialysis

Ashan M.et al, (2004), conducted a study on prevention of hemodialysis related muscle cramps by intra dialytic use of sequential compression devices. The study was conducted on four adult patients (mean age 61 ± 14 years) on thrice weekly hemodialysis who experienced two or more episodes of lower extremity cramping weekly. SCD intermittently applied at 40 mm Hg during treatment. SCD improves venous return and are commonly used to prevent lower extremity deep venous thrombosis. All 4 patients reported complete resolution of cramping during the study period that lasted 1 month or re consecutive dialysis treatments. In conclusion application of SCD to lower extremity may prevent the generation of lower extremity hemodialysis related cramping.

Cappy CS et al, 2005, conducted a study to assess The effects of exercise during hemodialysis on muscle cramps. The study was conducted in free- standing, outpatient dialysis centre with an average of 130 patients on staff-assisted hemodialysis. All the patients participated in a progressive, self-paced exercise program including cycling before or during hemodialysis, or walking on a treadmill before hemodialysis. In addition to this, patients also had the option of doing stretching and light weight exercises during hemodialysis. Performance tests included 60-second sit-stand, 28-ft slow and brisk walk, 60-second stair climb, and 60-second leg lifts. Patients' charts were reviewed for episodes of intradialytic cramping and hypotension. All patients showed improvement in measures of physical performance

at 3, 6, and 12 months. Mean phosphorus decreased from 1.94 +/- 0.45 mmol (6.02 +/- 1.4 mg/dL) by 11% at 3 months ($P = 0.05$) and by 26% at 12 months ($P < 0.02$). Patients who exercised for 12 months experienced a mean 16% reduction in blood glucose. Mean glucose levels for 7 diabetic patients decreased from 12.35 +/- 5.8 mmol/L (224.1 +/- 105) to 11.66 +/- 1.9 mmol/ 211.7 +/- 34 mg/dL). Decreases were noted in mean pre dialysis and post dialysis blood pressures and average interdialytic weight gains at 3, 6, and 12 months. They concluded that a formal intradialytic exercise regimen can produce objective evidence of improvement in muscle cramps over 3 to 12 months.

Susan Godfrey et.al (2010) conducted a randomized trial study on effect of intra dialytic low intensity strength training program for reducing muscle cramps in adult hemodialysis patients. 50 participants (mean \pm SD, age 63 ± 13 years) receiving long term hemodialysis (3.7 ± 4.2 years) were randomized to intra dialytic low density strength training or stretching exercises twice weekly for a total of 48 sessions. Exercise intensity was assessed by the Rate of Perceived Exertion (RPE) modified Omni scale (1-10). The results were Baseline median SPPB score was 6.0 with 57% of the people having SPPB below 7. SPPB improved in the strength training group compared to the attention controlled group ($p = 0.03$). Similarly strength training participants exhibited significant improvement from baseline compared to control group. In conclusion intra dialytic low intensity progressive strength training was safe and effective among maintenance hemodialysis patients.

Toffelmire E B, et al, 2010, conducted a quasi experimental study to evaluate the effect of intra dialytic low strength training program on muscle cramps during dialysis. Two group pre test, post test design was used for this study. 60 patients who

were under the age group of (15 -55) years on maintenance hemodialysis were selected as samples. In this study experimental group was given lower extremity resistance exercise during the 2nd hour of hemodialysis for about 10 to 15 minutes. The study period was 2 months. Whereas control group was not given any intervention. The severity of muscle cramps was evaluated before and after exercise program. Results were analyzed by using paired 't' test with $p = 0.001$ showed that there was a significant difference between mean score of muscle cramp intensity after applying intervention. Mean and SD in intervention and control group was 30 ± 6.96 and 25.6 ± 5.6 respectively, In conclusion they found that intra dialytic strength training program was effective among hemodialysis patients.

Anna Larcinese, RP, et al, 2011 conducted a study on effect of Intradialytic resistance band Exercise for muscle cramps in Patients on Maintenance hemodialysis. A total of 30 unselected adult patients on MHD from the centre, aged (70 ± 10.7 (mean \pm standard deviation) years), including 20 men and 10 women, accepted to follow the program under the supervision of qualified physiotherapists. Thirty-six exercise sessions of moderate intensity (twice a week, mean duration 40 minutes each, during 4.5 to 6 months), mainly involving leg muscles against an elastic resistance, were performed. In the result it was shown that the exercise program was well tolerated and all patients completed it. Statistically significant improvements were observed in the following tests: Tinetti test, (23.9 ± 3.9) points before versus (25.7 ± 3.5) points after the program ($P = .022$); the Timed Up and Go test, (12.1 ± 6.6 versus 10 ± 5.8) seconds ($P = .0156$). Improvements in the 6-minute walk distance and in the one-leg balance tests just failed to reach statistical significance. In this single-centre study, it was concluded that an intradialytic resistance band exercise

program was feasible, well tolerated, and showed encouraging results on muscle cramps.

Tae du jung et al , 2011, investigated the beneficial effects of exercise during hemodialysis to prevent dialysis related muscle cramps. Aerobic exercise such as cycling and resistance exercise such as supine- hip flexion, supine- hip abduction, supine straight leg raising and seated leg curl are beneficial in improving muscle cramps associated with hemodialysis and health related quality of life. The study was done on 40 hemodialysis patients. The patients were selected and allocated to experimental and control groups. The instrument used for this study was modified pain scale with the grading of (0-10), 0 -stands for no muscle cramps and 10- stands for severe muscle cramps. The result shows that post test mean score of muscle cramps of an experimental group were significantly lower than that of a control group.

Ragnarsdottir M. et al, 2012 , conducted a study to find out the effectiveness of intra dialytic stretching exercise program on muscle cramps at Taiwan. 30 patients were randomly selected to control group and experimental group. Control group received regular treatments and experimental group received a 10 minute lower extremity stretching exercise including, calf muscle massaging, leg crossing, seated leg curl seated knee extension and flexion. Muscle cramps was assessed by modified pain scale. Before intervention the intensity of muscle cramps was 6 ± 1.9 , after the intervention was 3.5 ± 5 . In control group the mean of muscle cramps intensity before and after intervention was respectively 5 ± 2.1 and 4.8 ± 1.7 . Independent 't' test showed a significant reduction in intensity of muscle cramps between experimental and control group.

Zahra abbasi, 2013, conducted a study on effect of intra dialytic stretching exercise on severity of symptoms muscle cramps in hemodialysis patients. The study was conducted on 37 hemodialysis patients; Study samples were selected randomly and allotted in experimental and control group. Patients in exercise group performed a 30 minute stretching exercise on legs three times a week during the last 2 hours of every hemodialysis sessions for 8 weeks. Data were analyzed by chi square and 't' test. At the end of the 8 weeks, the exercise group (n=17) had a significant improvement in reduction of muscle camps compared with the control group ($p < 0.01$). It was concluded that intra dialytic stretching exercises are effective in hemodialysis patients for reducing the symptoms of muscle cramps.

Basemath S.S.Mork , 2014, conducted a study on effect of intra dialytic stretching exercise on muscle cramps among hemodialysis patients. 45 study samples were selected purposively. Various factors of muscle cramps were scored in a scale of (0 – 13). 0 indicates no cramps, 1-4 mild cramps, 5-8 moderate cramps, 9-13 severe cramps. The data obtained was analyzed by paired t –test. After performing the intra dialytic stretching exercise it was found that 40% had no muscle cramps and 24.4% had mild cramps and 35.6% had moderate cramps. In conclusion the study findings showed that intra dialytic stretching exercise every 30 minutes during the last hour of dialysis helped to reduce and even prevent muscle cramps.

CHAPTER III

Methodology

This chapter depicts the description and various steps adapted to collect and organize data for the present study. The study was intended to assess the effectiveness of Intra dialytic stretching exercise in reducing muscle cramps among hemodialysis patients.

The research methodology includes research approach, research design, setting, population, samplings, selection criteria, development of tool, and description of tool, the procedure for data collection and plan for data analysis.

Research Approach

Research process is an orderly way of dealing with the research problem, where variables are generally studied in numerical form. Research approach used in this study was quantitative evaluative research approach.

Research Design

Research design used in this study was quasi experimental design (ie) two group pre and post test design.

The research design is diagrammatically represented as below.

$$\mathbf{E} - O_1 \quad \mathbf{X} \quad O_2$$

$$\mathbf{C} - O_1 \quad - \quad O_2$$

E – Experimental group.

C – Control group

O_1 -Pretest to assess the severity of muscle cramps before intervention.

O_2 -Post test to assess muscle cramps after the intervention.

X- Intervention (Intradialytic stretching exercise)

--- - No intervention.

Variables

Independent Variable

Intra dialytic stretching exercise.

Dependant Variable

Hemodialysis patients experiencing muscle cramps.

Demographic Variables

Age, sex, duration of hemodialysis, practice of physical exercise, frequency of dialysis and clinical variables such as, blood pressure, serum creatinine level, and weight gain.

Setting

The study was conducted at Sree Mookambika Medical College Hospital, Kulasekaram. The hospital is a 750 bedded multi speciality hospital with an exclusive dialysis unit which has 10 dialyser machines and about 95 patients are treated regularly in this unit and each patient is undergoing 3 sessions in a week.

Population

Target population

All the patients undergoing hemodialysis.

Accessible populations

The accessible population selected for this study is hemodialysis patients experiencing muscle cramps among the age group of 25 – 65 years in SreeMookambika Medical College Hospital, Kulasekharam.

Method Of Sample Selection

Sample Size

The sample size for this study was 60 between the age group of 25- 65 years. Among 60, 30 patients allotted to the experimental group and 30 allotted to the control group.

Sampling Technique

Samples were selected based on purposive sampling technique.

Criteria For Sample Selection

Inclusion Criteria

1. Patient undergoing hemodialysis with the age group of 25 – 65 years
2. Patients undergoing hemodialysis experiencing muscle cramps

Exclusion Criteria

1. Emergency hemodialysis patients.
2. Patients with AV fistula at femoral region
3. Patients with lower limb pathology and with varicose vein.
4. Clients who were terminally ill.
5. Clients with musculo skeletal deformities, fracture of the lower extremities ,etc.
6. Clients with burns and ulcers in lower limbs and with diabetic foot.

Data Collection Tool

The tool consists of two parts.

Section A

Demographic variables such as age, sex, duration of dialysis, frequency of dialysis, and clinical variables such as blood pressure, serum creatinine, weight gain.

Section B

It explains the characteristics of muscle cramps with intensity, duration and frequency of muscle cramps and a symptom assessment checklist.

The level of muscle cramps is classified as follows,

Mild leg cramps	1 - 3
Moderate leg cramps	4 - 6
Severe leg cramps	7 - 9

Testing Of Tool

Validity

Content validity of tool was established on the basis of the opinion of five experts. One Nephrologist from Sreemookambika Medical College Hospital and four medical and surgical nursing personnel. The necessary suggestion and modification was incorporated in the final preparation of tool.

Reliability

The reliability of the tool was identified by inter rated method. The r-value is 1.00. Hence, the tool was reliable.

Data Collection Procedure

Data was collected in the hemodialysis unit of SreeMookambika Medical College Hospital in the month of May 2015. 60 samples were selected based on inclusion and exclusion criteria. Pre test was conducted to both experimental group and control group by using muscle cramps assessment tool. Intra dialytic stretching exercise was provided for 15 minutes during the second hour of dialysis daily for 2 sessions per week for the experimental group where as control group was not given any intervention. Post test was conducted after 30 days for both experimental and control group.

Plan For Data Analysis

Data analysis was done by using descriptive and inferential statistics to assess the level of muscle cramps. Inferential statistical methods like 't' test and 'chi square test' were used to find out the effectiveness and association between variables.

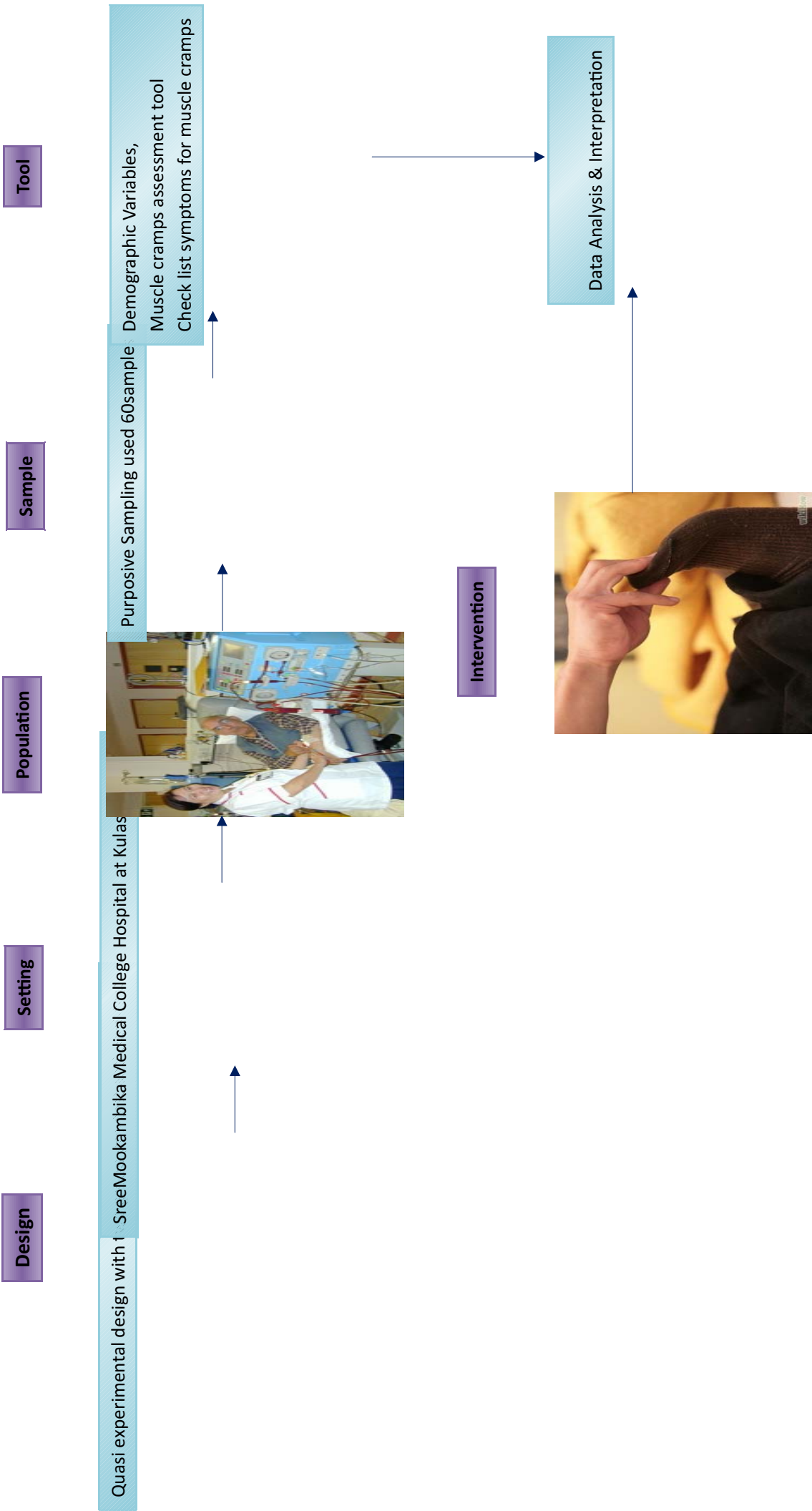


Figure 2. Schematic Representation of Research Design

CHAPTER IV

Data Analysis And Interpretation

This chapter deals with the analysis and interpretation of data collection in accordance with the objectives stated for the study. The data collected were analyzed by using descriptive and inferential statistics. The test score was analyzed by statistical mean and standard deviation, the significance difference of mean scores were interpreted by 't' test.

The difference between pre test and post test were assessed by unpaired 't' test. The association between demographic and clinical variables and muscle cramps were analyzed by 'chi square test'.

Objectives Of The Study

1. To assess the level of muscle cramps among patients who are undergoing hemodialysis.
2. To assess the effectiveness of intra dialytic stretching exercise on reducing the muscle cramps among patients undergoing hemodialysis in experimental group.
3. To find out the association between level of muscle cramps and selected demographic variables such as age, sex, Duration of hemodialysis, Frequency, Practice of physical exercise and clinical variables such as serum creatinine level, pulse pressure, and weight gain.

The data collected was tabulated and presented as follows.

Section A

This section displays the demographic variables of the subjects selected by the investigator

Section B

It deals with effectiveness of intra dialytic stretching exercise in reducing muscle cramps among hemodialysis patients in experimental group.

Section C

This section deals with association between muscle cramps and selected demographic and clinical variables.

Table 1

Percentage Distribution Of Study Subjects According to Demographic Variables

N = 60

Demographic variables	Experimental group		Control group		Total		χ^2
	f	%	f	%	f	%	
Age Group							
26 – 35 yrs	2	7	2	7	4	7	
36 – 45 yrs	3	10	8	27	11	18	
46 – 55 yrs	7	23	8	27	15	25	8.3
56 - 65 yrs	18	60	12	40	30	50	
Sex							
Male	20	67	23	77	43	72	
Female	10	33	7	23	17	28	0.85
Duration Of Dialysis							
1 year	13	43	7	23	20	33	
2 years	12	40	16	53	28	47	3.1
Maintenance	5	17	7	23	12	20	

Frequency Of Dialysis							
Once a week	0	0	0	0	0	0	
Twice a week	30	100	30	100	60	100	0.016
Thrice a week	0	0	0	0	0	0	
Practice Of physical exercise							
Regular	21	70	16	53	37	62	
Irregular	9	30	14	47	23	38	2.3
Clinical Variables							
Serum Creatinine							
0 – 5 mg/dl	2	7	0	0	2	3	
5.1 – 10 mg/dl	14	47	7	23	21	35	0.8
10.1 – 15 mg/dl	14	47	23	77	37	62	
Pulse Pressure							
0 – 50 mm /Hg	6	20	2	7	8	13	
55 – 100 mm/Hg	23	77	26	87	49	82	3.8
105 – 150 mm/Hg	1	3	2	7	3	5	
Weight gain							
1 – 2 kg	7	23	10	33	17	28	
2.1 – 3 kg	11	37	9	30	20	33	5.2
3.1 – 4 kg	10	33	11	37	21	35	
Above 4 kg	1	3	0	0	1	2	

The above table 1 describes the distribution in number and percentage of study subjects according to their demographic variables and clinical variables. Out of 60 samples 7% were in the age group of 26--35 years, 18% were in the age group of 36-45 years. 25% were in the age group of 46-55 years. 50% were in the age group of 56—65 years. In relation to sex, 72% were Males, 28% were Females. Regarding to duration of dialysis 33% were under 1 year, 47% were under 2 years and 20% were on maintenance dialysis. About frequency of dialysis all the subjects (100%) taking weekly twice dialysis therapy. Regarding practice of physical exercise 62% were in regular category and 38% were in irregular category.

In the clinical variables, 13% of samples had pulse pressure of 10—50 mm/Hg, 81% had pulse pressure of 55—100 mm/Hg, 6% had pulse pressure of 105—150 mm/Hg. About serum creatinine level, 3% samples had 0—5 mg/dl, 35% had 5.1—10 mg/dl, 62% had 10.1—15 mg/dl. Regarding weight gain, 28% were under the category of 0—2 kg weight gain , 33% were under 2.1 – 3 kg category , 37% were under 3.1—4 kg category and 2% were above 4 kg weight gain category.

The above findings are presented as figures from –

1. Distribution of samples according to age in experimental group and control group presented as bar diagram in figure 3.
2. Distribution of samples according to sex in experimental and control group presented as bar diagram in figure 4.
3. Distribution of samples according to Duration of dialysis in experimental group and control group presented as bar diagram in figure 5.
4. Distribution of samples according to practice of physical exercise in experimental and control group presented as bar diagram in figure 6.
5. Distribution of samples according to frequency of dialysis in experimental group and control group presented as bar diagram in figure 7.
6. Distribution of samples according to serum creatinine level in experimental group and in control group presented as bar diagram in figure 8.

7. Distribution of samples according to pulse pressure in experimental group and control group presented as bar diagram in figure 9.
8. Distribution of samples according to weight gain in experimental group and in control group presented as bar diagram in figure 10.

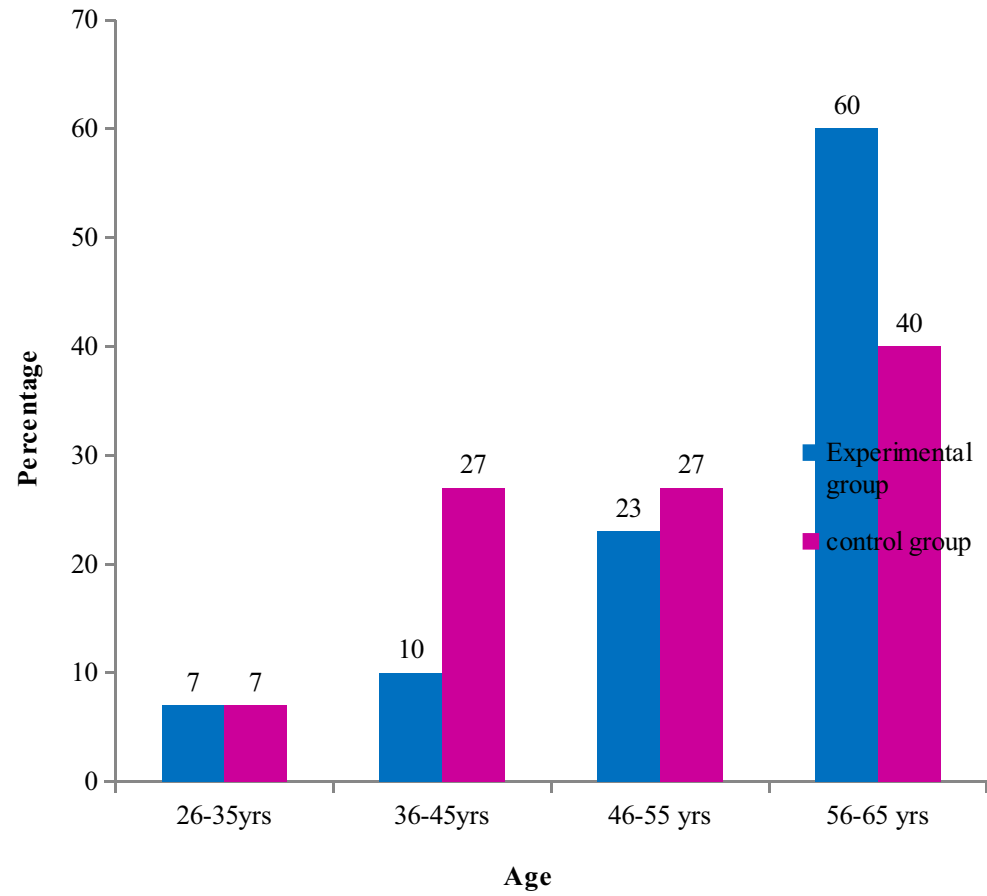


Figure 3. Distribution Of Sample According To Age in Experimental And Control Group.

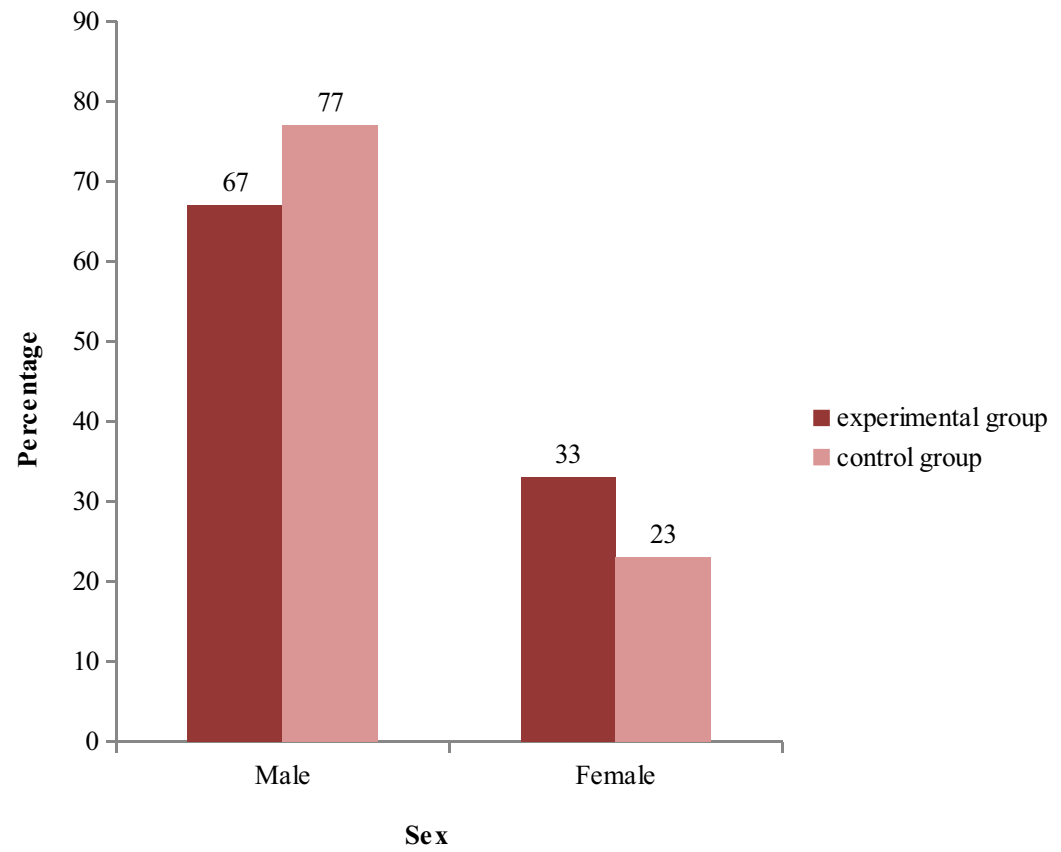


Figure 4. Distribution Of Demographic Variables According to Sex In Experimental Group And Control Group.

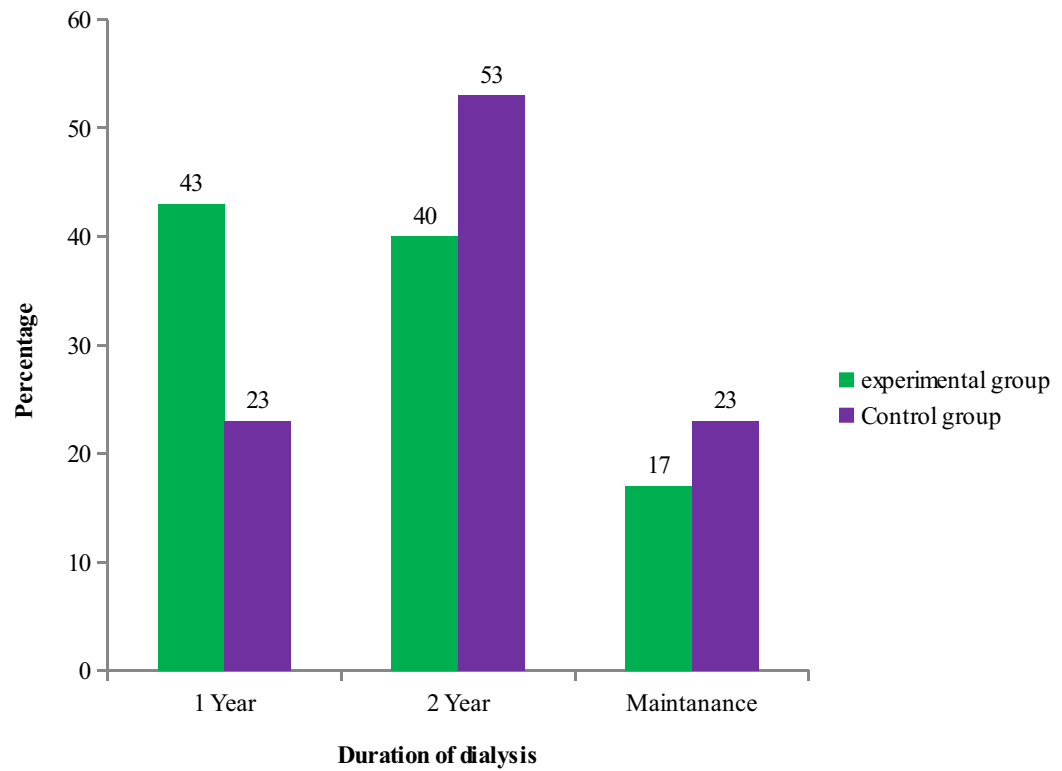


Figure 5. Distribution Of Sample According To Duration Of Dialysis In Experimental Group and In Control Group.

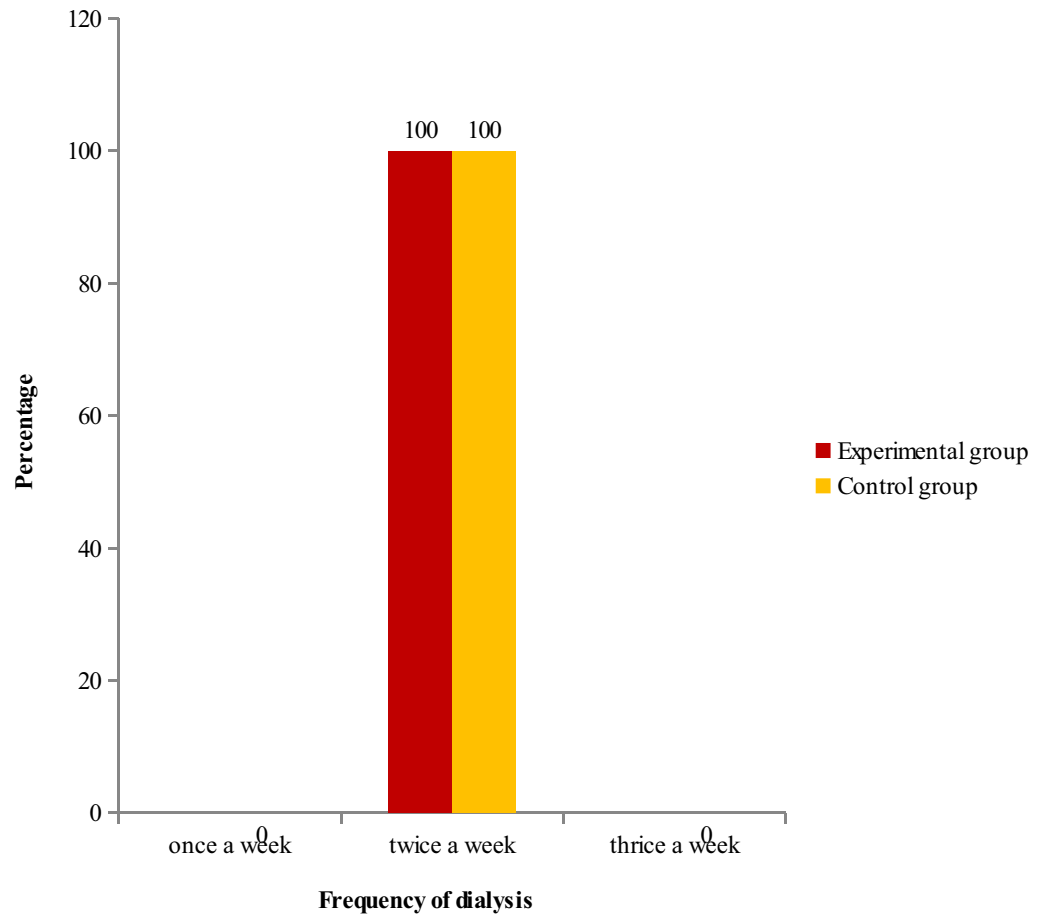


Figure 6. Distribution Of Sample According to Frequency Of Dialysis In Experimental And Control group.

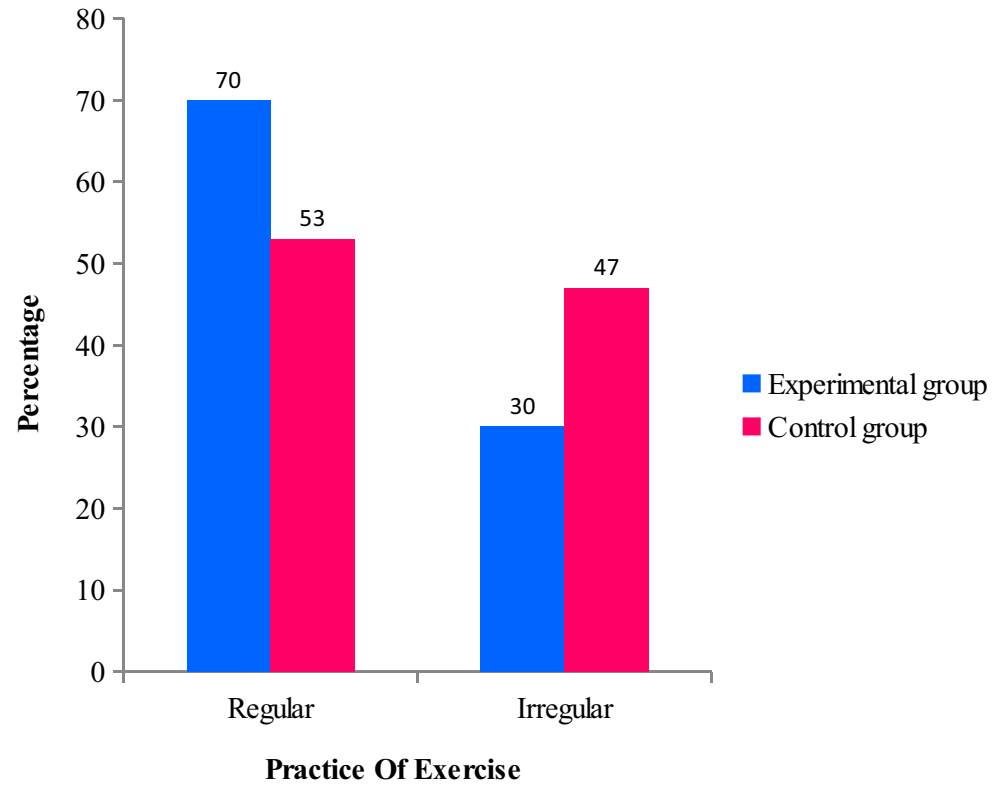


Figure 7. Distribution Of Sample Based On Practice Of Exercise In Experimental And Control Group.

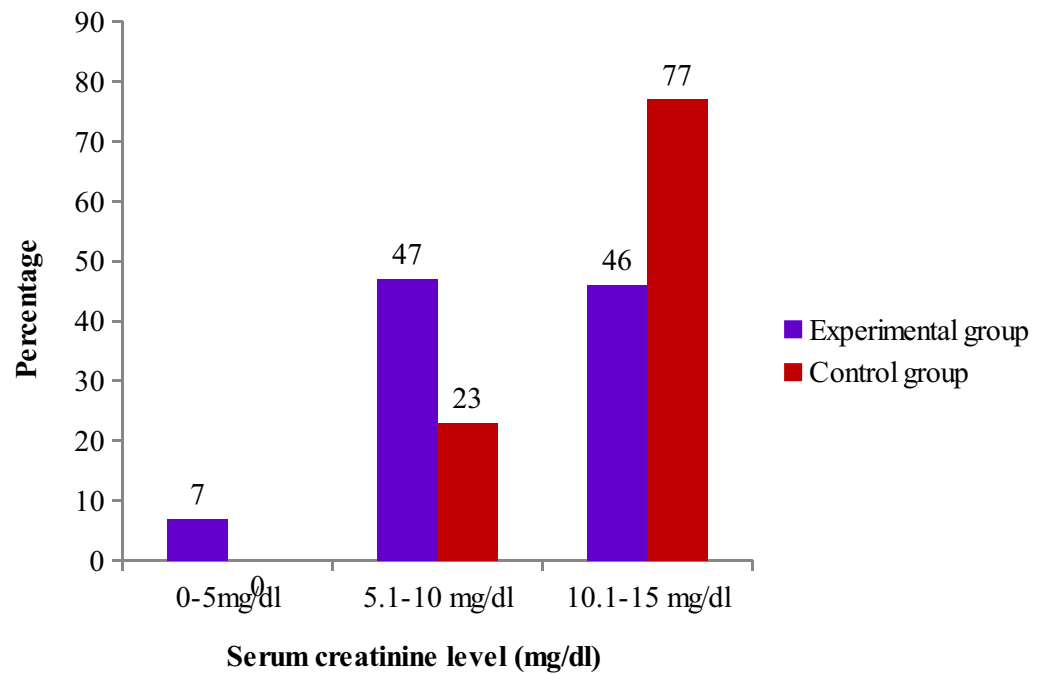


Figure 8. Distribution of Sample According To Serum Creatinine Level In Experimental And Control Group.

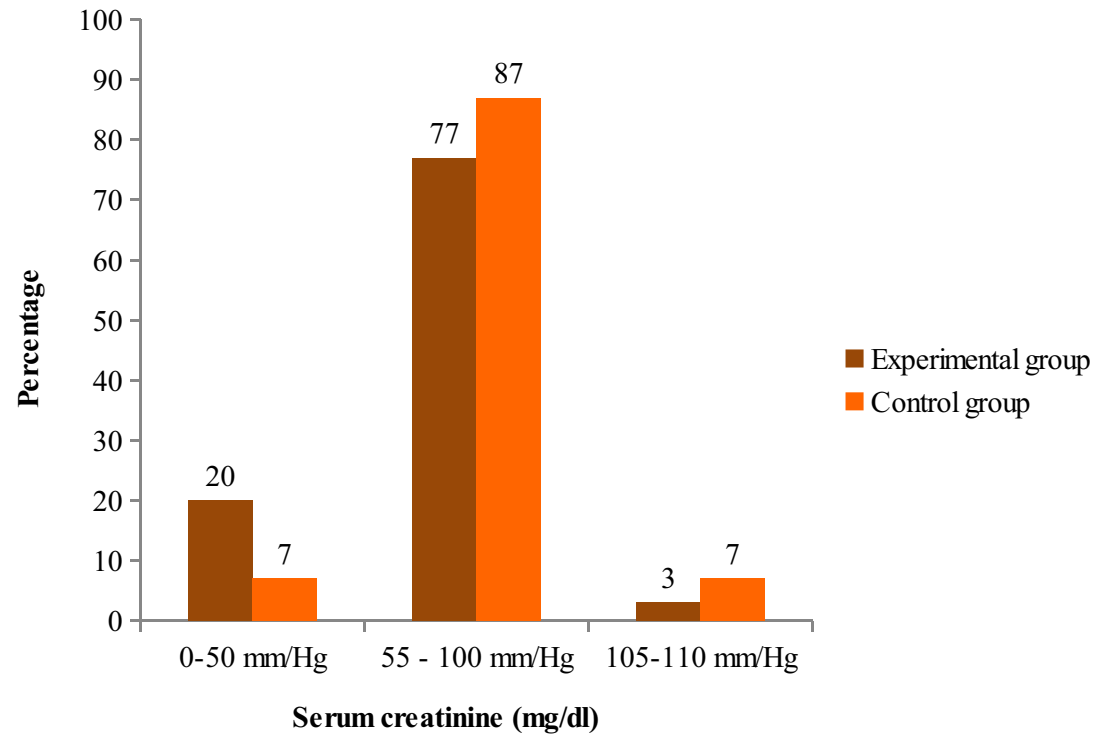


Figure 9. Distribution Of Sample According To Pulse Pressure (mm/Hg) In Experimental and Control Group.

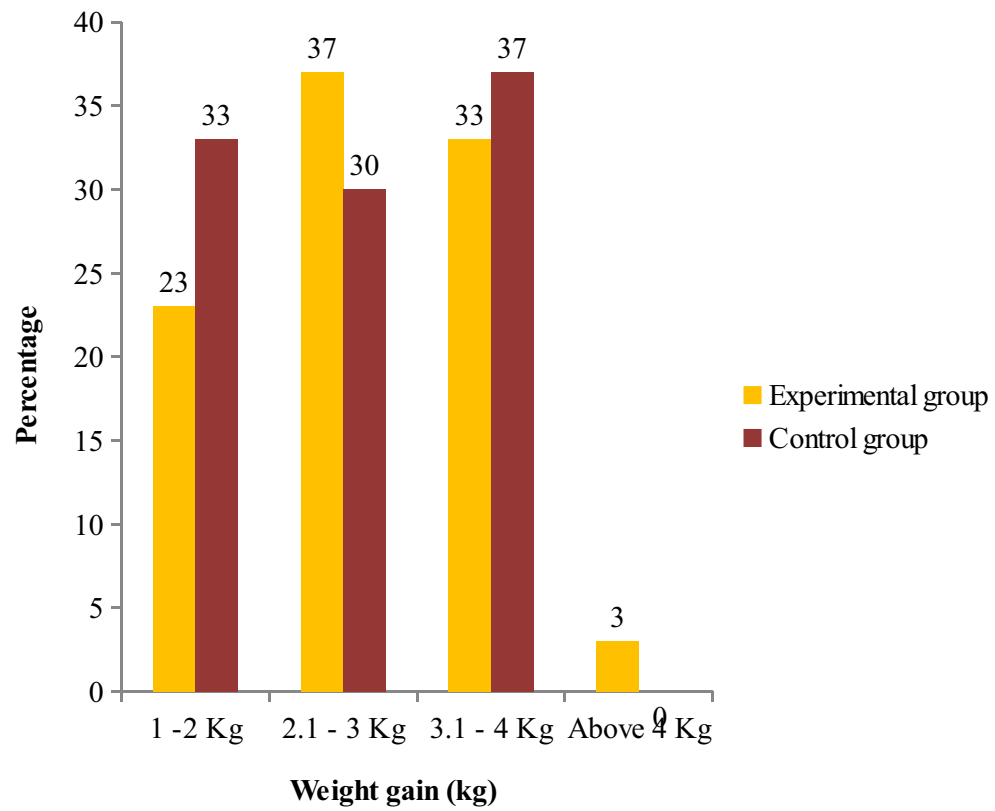


Figure 10. Distribution Of Sample According To Weightgain In Experimental And Control Group.

Table: 2

Frequency And Percentage Distribution According To Level Of Muscle Cramps.

N = 60

Description	Experimental Group				Control Group			
	Pre Test		Post Test		Pre Test		Post Test	
	f	%	f	%	f	%	f	%
Mild Cramps	0	0	26	87	0	0	5	17
Moderate Cramps	10	33	4	13	13	43	23	76
Severe Cramps	20	67	0	0	17	57	2	7

The above table 2 shows the frequency and distribution of sample according to the level of muscle cramps. In the experimental group 67% experienced severe cramps and 33% experienced moderate cramps in pre test. In the control group in pre test, 57% experienced severe cramps and 43% experienced moderate cramps. Where as in post test 13% experienced moderate cramps and 87% experienced mild cramps in the experimental group and in the control group, 7% experienced severe cramps, 77% experienced moderate cramps and 17% experienced mild cramps.

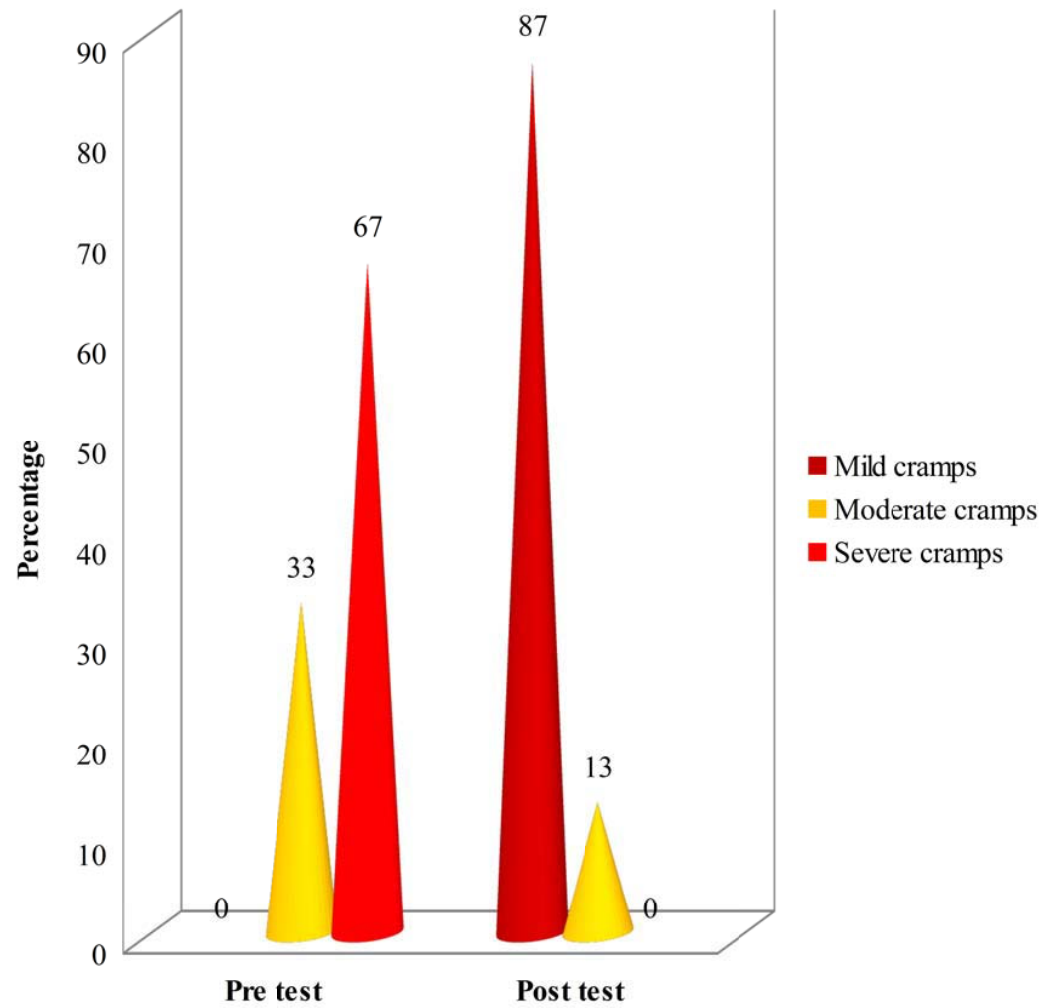


Figure 11. Frequency And Percentage Distribution Of Sample According to Level Of Muscle Cramps In Experimental Group.

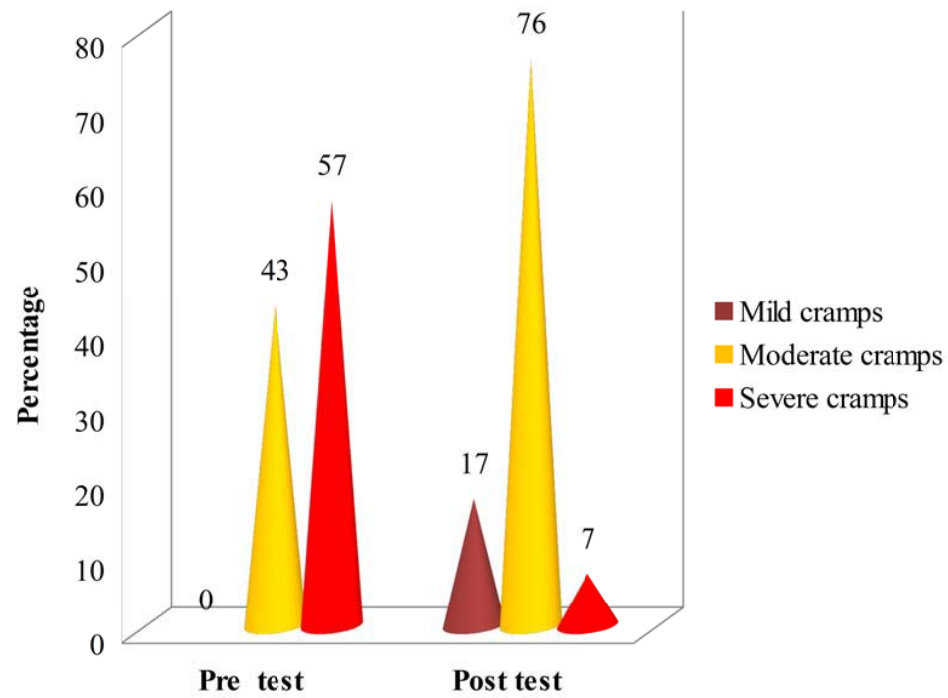


Figure 12. Frequency And Percentage Distribution Of sample According To Level Of Muscle Cramps In Control Group .

Table 3

Check List Symptoms Shows Frequency And Distribution Of Muscle Cramps

N = 60

Descriptio n	Experimental Group				Control Group			
	Pre Test		Post Test		Pre Test		Post Test	
	f	%	f	%	f	%	f	%
Mild cramps	0	0	25	83	1	3	9	30
Moderate cramps	19	63	5	17	22	73	21	70
Severe Cramps	11	37	0	0	7	23	0	0

Based on checklist, in the pre test 37% experienced severe cramps, 63% experienced moderate cramps in the experimental group, and in the control group 17% experienced moderate cramps and 83% experienced mild cramps

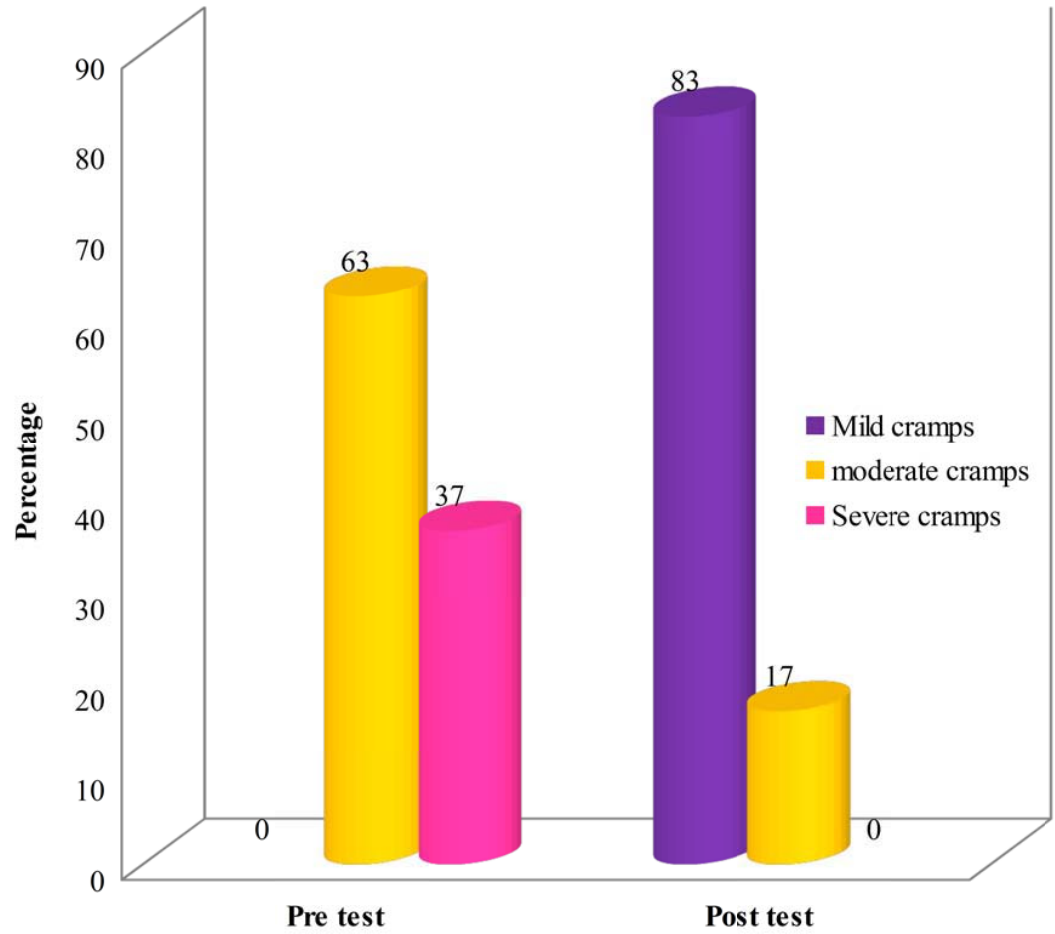


Figure13. Frequency And Percentage Distribution Of Sample According To Level Of Muscle Cramps In Experimental Group Based On Checklist Symptoms.

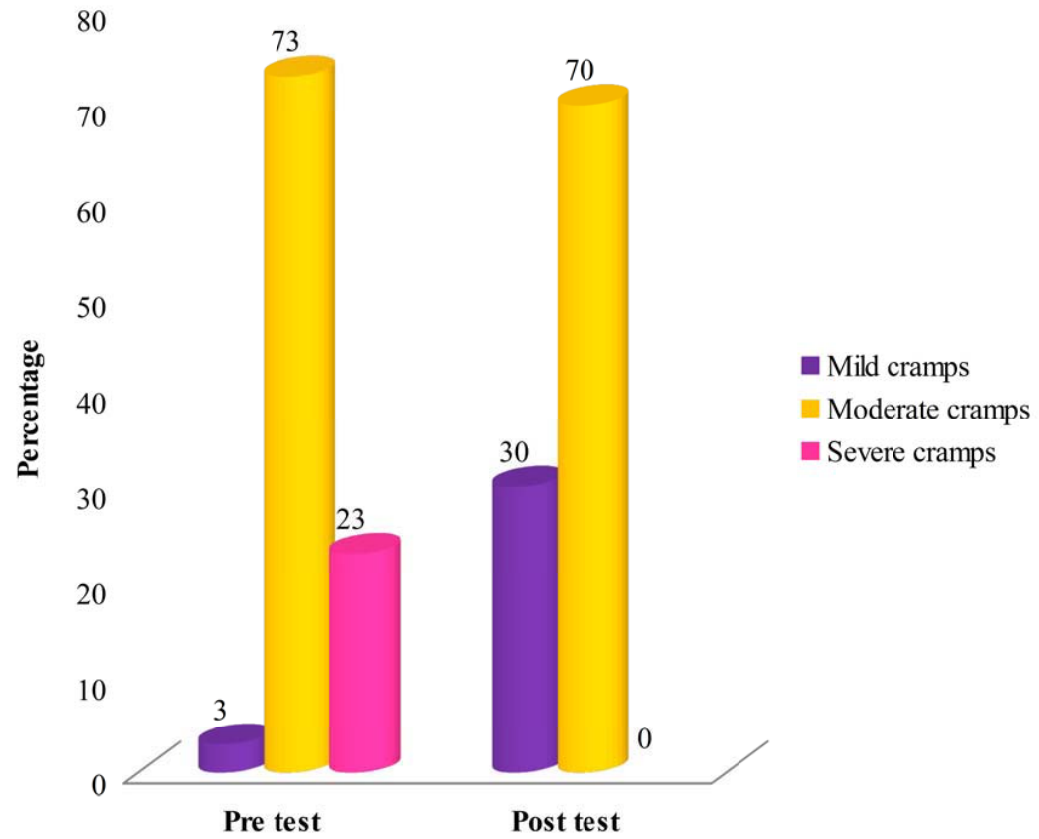


Figure 14: Frequency And Percentage Distribution Of Sample According To Level Of Muscle Cramps In Control Group Based On Checklist Symptoms.

Table 4

Effectiveness Of Intra Dialytic Stretching Exercise In Reducing Muscle Cramps In Experimental Group.

N = 60

Type Of Tool	Study Groups	Pre Test		Post Test		Mean Difference		df	t	Table Value
		Mean	sd	Mean	sd	Mean	Sd			
Muscle cramps assessment tool	Experimental group	6.8	0.97	2.2	1.06	4.5	0.21			
	Control group	6.5	0.94	5.06	1.35	1.6	0.32	58	36.25*	2.04
Check list	Experimental group	2.3	0.47	1.1	1.7	1.2	0.01			
	Control group	2.2	0.44	0.37	0.45	0.5	0.11	58	5.6*	2.04

*Significant at $p < 0.05$

The above table 4 shows the effectiveness of intra dialytic stretching exercise in reducing muscle cramps in experimental group and control group. The pretest mean of experimental group was 6.8 and control group was 6.5. Post test the mean of experimental group was 2.2 and control group was 5.06.

The reduction of muscle cramps from pretest to post test among experimental group was 4.5 ± 0.21 and the same of control group was 1.6 ± 0.32 . The mean reduction in the experimental group was statistically highly significant ($t = 36.5^*$, $df = 58$ and $p < 0.05$).

Based on check list symptoms, the pre test mean of experimental group was 2.3 and control group was 2.2. Post test mean of experimental group was 1.1 and control group was 1.7. The reduction of muscle cramps from pre test to post test among experimental group was 1.2 ± 0.01 and the same of control group was 0.5 ± 0.11 . The mean reduction in the experimental group was statistically highly significant ($t = 5.6^*$, $df = 58$ and $p < 0.05$).

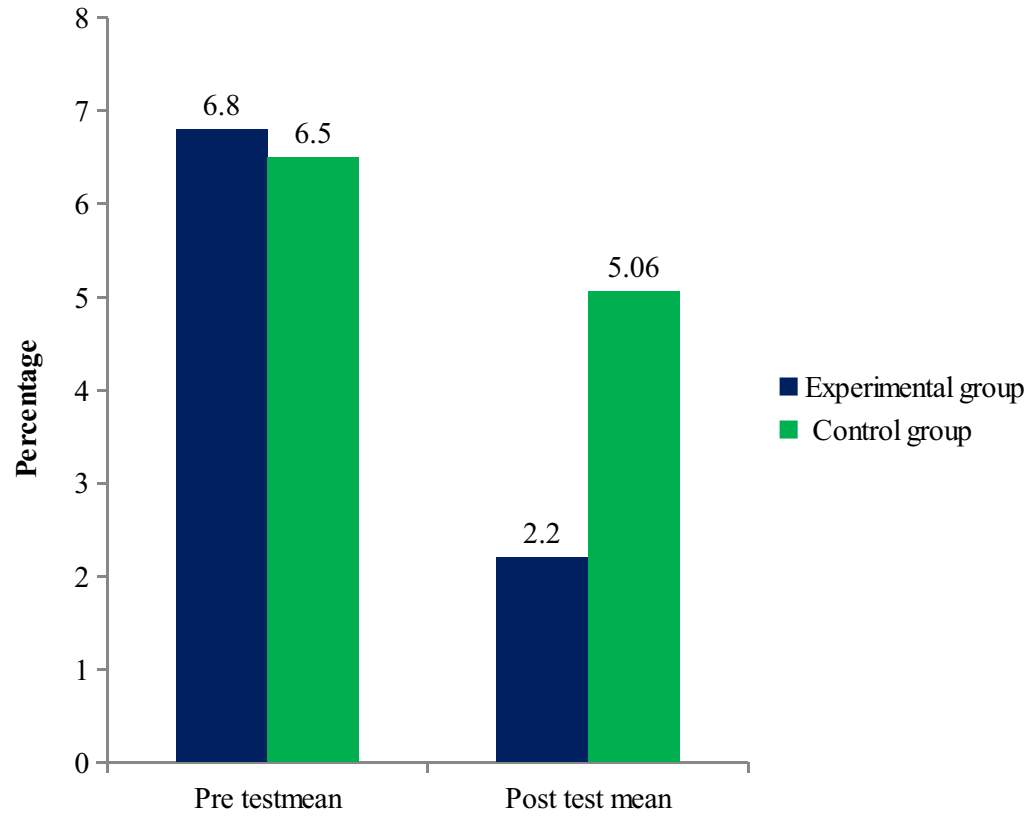


Figure 15. Effectiveness of Intra Dialytic Stretching Exercise In Rducing Muscle Cramps Among Hemodialysis Patients In Experimental And Control Group.

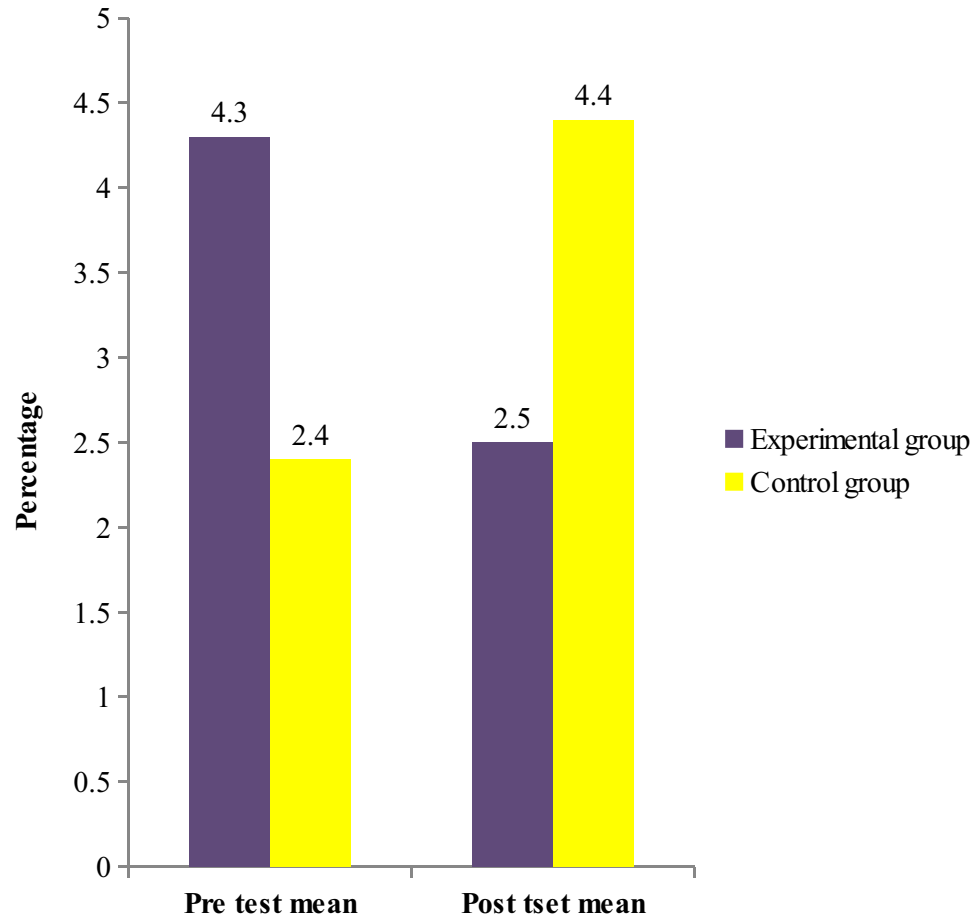


Figure16. Effectiveness Of Intra Dialytic Stretching Exercise In Reducing Muscle Cramps Among Hemodialysis Patients Based On Check List Symptoms.

Table: 5

Comparison Of Mean In Experimental Group After Intra Dialytic Stretching Exercise With Control Group.

N = 60

Type Of Tool	Group	Mean Difference		df	't'	Table value
		Mean	Sd			
Muscle Cramps Assessment Tool	Experimental Group	4.5	0.2s1	58	36.25*	2.04
	Control Group	1.6	0.32			
Check List	Experimental Group	1.2	0.01	58	5.6*	2.04
	Control Group	0.5	0.11			

*Significant at $p < 0.05$

The table 4 explains the comparison of experimental group and control group regarding muscle cramps. t value 36.5* which is greater than the table value ($t = 2.04$, $df = 58$, and $p < 0.05$) which shows highly significant. So the research hypothesis (H1) being accepted.

The above findings are presented as figure –

1. Mean reduction of pain in experimental group after intra dialytic stretching exercise with control group as presented as cone diagram in figure – 17 and 18.

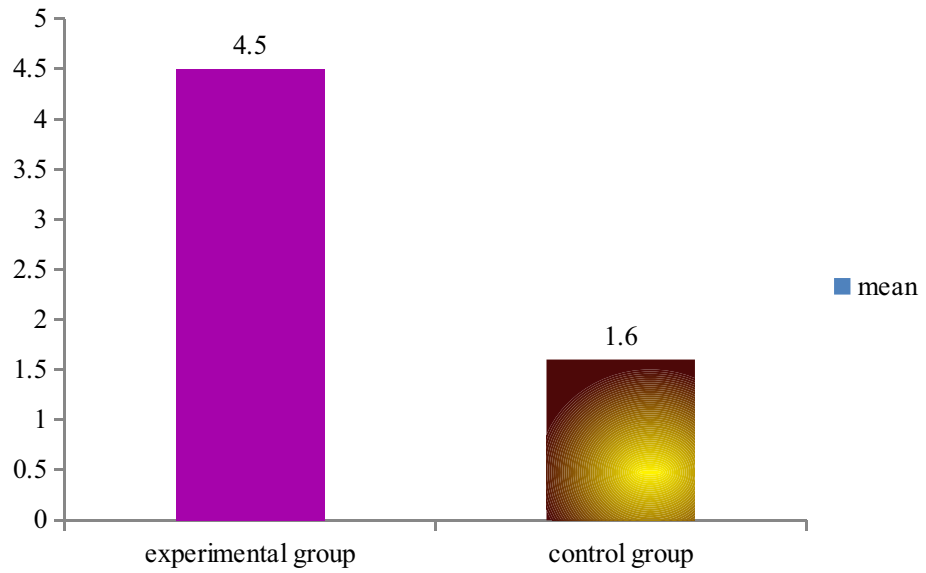


Figure 17. Comparison of Mean In Experimental And Control Group After Intra Dialytic Stretching Exercise.

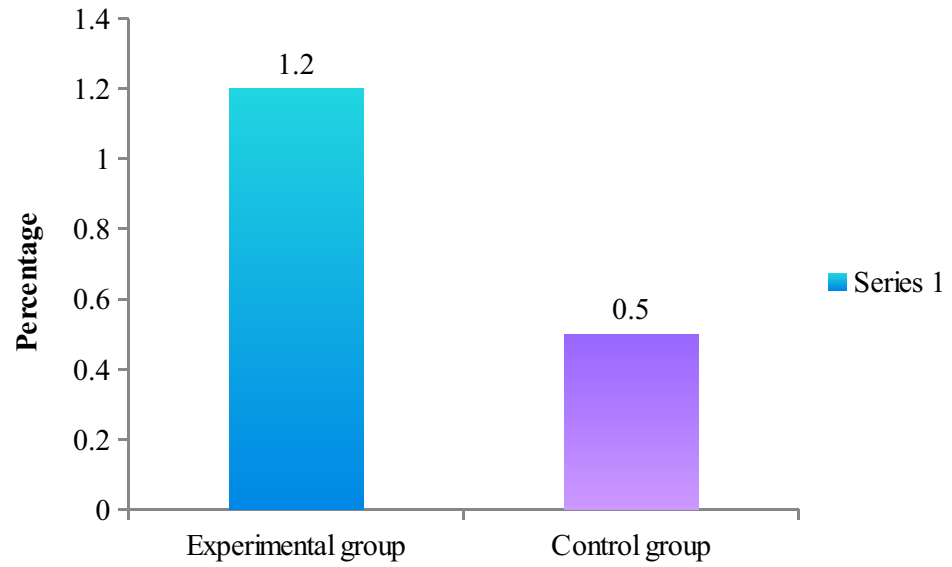


Figure 18. Comparison Of Mean In Experimental And Control Group After Intra Dialytic Stretching Exercise Based On Checklist Symptoms.

Table: 6

Association Between The Level Of Muscle Cramps And Selected Demographic Variables.

N = 60

Demographic Variables	χ^2	df	Table Value
Age Group			
26 – 35 yrs			
36 – 45 yrs	8.3*	3	7.8
46 – 55 yrs			
56 – 65 yrs			
Sex			
Male	0.085		3.84
Female			
Duration Of Dialysis			
1 year			
2 year	3.1		5.99
Maintenance			
Frequency Of Dialysis			
Once in a week			
Twice a week	0.016		5.99
Thrice a week			
Practice Of physical Exercise			
Regular	2.3		3.84
Irregular			
Clinical Variables			
Serum Creatinine			
0 - 5 mg/dl			
5.1 – 10 mg/dl	0.8		5.99
10.1 – 15 mg/dl			
Pulse Pressure			
10 – 50 mm/Hg	3.8		5.99
55 – 100 mm/Hg			

105 – 150 mm/Hg		
Weightgain		
0-1kg		
1.1 – 2 kg		
2.1 – 3 kg	5.2	7.8
3.1 – 4kg		
Above 4		

The above table 6 describes the association between the level of muscle cramps with demographic variables both in experimental group and control group. The result shows that there is an association between the level of muscle cramps and practice of physical exercise. So the research hypothesis (H2) was accepted.

CHAPTER V

Results And Discussion

The present study was undertaken to assess the effectiveness of intra dialytic stretching exercise in reducing muscle cramps among hemodialysis patients in Sree Mookambika Medical College Hospital, Quasi experimental design was adopted with two group pre test post test design for the study. The level of muscle cramps was assessed by Modified muscle cramps assessment tool and with symptoms of muscle cramps. The result and discussion of the study are based on the findings obtained from the statistical analysis.

Objectives Of The Study:

1. To assess the level of muscle cramps among patients who are undergoing hemodialysis.

2. To assess the effectiveness of intra dialytic stretching exercise on reducing the muscle cramps among patients undergoing hemodialysis in experimental group
3. To find out the association between level of muscle cramps and selected demographic variables such as age, sex, Duration of hemodialysis, Frequency, Practice of physical exercise etc.

Distribution Of Selected Characteristics Of the Study Subjects.

The demographic variables of experimental and control group was matched with their age, sex, duration, frequency, practice of physical exercise and clinical variables such as serum creatinine, pulse pressure, weight gain.

The above table 1 describes the distribution in number and percentage of study subjects according to their demographic variable. The study findings revealed that 7% were in the age group of 26--35 years, 18% were in the age group of 36-45 years, 25% were in the age group of 46-55 years. 50% were in the age group of 56—65 year. The percentage distribution based on sex revealed that 72% were Males, 28% were Females. Among the total samples 33% were under 1 year duration of hemodialysis , 47% were under 2 years and 20% were on maintenance dialysis. About frequency of dialysis all the subjects (100%) taking weekly twice dialysis therapy. While considering practice of physical exercise 62% were in regular category and 38% were in irregular category.

In the clinical variable 81% had pulse pressure of 55—100 mm/Hg, 6% had pulse pressure of 105—150 mm/Hg. About serum creatinine level, 62% had 10.1—15 mg/dl. Regarding weight gain, 28% were under the category of 0—2 kg weight gain , 33% were under 2.1 – 3 kg category , 37% were under 3.1—4 kg category and 2% were above 4 kg weight gain category. From the above sample it is observed that the experimental and control group were matched in their age, sex, duration , practice of physical exercise, frequency of dialysis and clinical variables.

The above table 2 shows the frequency distribution of sample according to the level of muscle cramps. In experimental group 67% experienced severe cramps and

33% experienced moderate cramps in pre test and in the post test 13% experienced moderate cramps and 87% experienced mild cramps, In the control group in pre test, 57% experienced severe cramps and 43% experienced moderate cramps and in post test 7% experienced severe cramps, 77% experienced moderate cramps

The study findings of the 60 samples were discussed based on the objectives of the study.

The first objective of the study **was to assess the level of muscle cramps among patients who are undergoing hemodialysis.** This study reveals that 62% experienced severe cramps and 38% experienced moderate cramps.

The study findings were congruent with the study Abdulla .A.J.1999. The study findings showed that the prevalence of muscle cramps among hemodialysis patients were 50 % and cramps were commener in females (56%) than males(44%).

The second objective of the study **was to assess the effectiveness of intra dialytic stretching exercise on muscle cramps among patients undergoing hemodialysis in experimental group**

The pretest mean of experimental group was 6.8 and control group was 6.5. Post test the mean of experimental group was 2.2 and control group was 5.06. The reduction of muscle cramps from pretest to post test among experimental group was 4.5 ± 0.21 and the same of control group was 1.6 ± 0.32 . The comparison of mean in the experimental group was statistically highly significant ($t = 36$, $df = 58$ and $p < 0.05$).

The study findings were congruent with the following studies.

Zahra abbasi 2013 conducted a study among 37 hemodialysis patients experiencing intra dialytic cramps. At the end of 8 weeks of stretching exercise program, there was a significant reduction of muscle cramps in experimental group than control group.($p < 0.01$)

Basemath S.S.Mork , 2014, conducted a study on effect of intra dialytic stretching exercise on muscle cramps among hemodialysis patients. 45 study samples were selected purposively. After performing the intra dialytic stretching exercise it was found that 40% had no muscle cramps and 24.4% had mild cramps and 35.6% had moderate cramps.

Ragnarsdottir M.et al, 2012 .conducted a study to find out the effectiveness of intra dialytic stretching exercise program on muscle cramps at Taiwan. 30 patients were randomly selected to control group and experimental group. Control group received regular treatments and experimental group received a 10 minute lower extremity stretching exercise including, calf muscle massaging, leg crossing, seated leg curl seated knee extension and flexion. Muscle cramps was assessed by modified pain scale. Before intervention the intensity of muscle cramps was 6 ± 1.9 , after the intervention was 3.5 ± 0.5 . In control group the mean of muscle cramps intensity before and after intervention was respectively 5 ± 2.1 and 4.8 ± 1.7 . Independent 't' test showed a significant reduction in intensity of muscle cramps between experimental and control group.

The third objective of the study was **to find out the association between level of muscle cramps and selected demographic variables such as age, sex, duration of hemodialysis, frequency, practice of physical exercise etc.**

The above table 5 describes the association between level of muscle cramps and demographic variables in both experimental and control group. The table clearly shows that there is an association between the level of muscle cramps and age.

The study was congruent with the study conducted by Abdulla A.J et al 2013, According to his findings muscle cramps are common in females than males. He also conducted the study among elderly population to find out the prevalence of muscle cramps.the age group undertaken for his study was above 65 years. And he found that 50% of them having muscle cramps.

Conclusion

The study identified that the level of muscle cramps was reduced in experimental group. It was found that there was a significant reduction in the level of muscle cramps of experimental group after intra dialytic stretching exercise than in control group. The 't' value of difference of mean reduction of muscle cramps tabulated was found to be $t = 36.$, $df = 58$, $p < 0.05$.The study also shows that there was an association between the level of muscle cramps and age group.

CHAPTER VI

Summary, Conclusion, Nursing Implications And Recommendations.

Summary Of The Study

The study was undertaken to assess the effect of intradialytic stretching exercise in reducing muscle cramps among hemodialysis patients in SreeMookambika Medical College and Hospital, Kanyakumri district.

Objectives Of The Study:

1. To assess the level of muscle cramps among patients who are undergoing hemodialysis.
2. To assess the effectiveness of intra dialytic stretching exercise on reducing the muscle cramps among patients undergoing hemodialysis in experimental group.
3. To find out the association between level of muscle cramps and selected demographic variables such as age, sex, duration of hemodialysis, frequency, practice of physical exercise and clinical variables such as serum creatinine level, pulse pressure, weight gain.

Hypothesis

H1 – There is a significant reduction of muscle cramps among clients after Intra dialytic exercise administration at 0.05 level of significance

H2 - There is association between muscle cramps and selected demographic variables such as age, sex, duration of hemodialysis, frequency, practice of physical exercise, and clinical variables such as serum creatinine level, pulse pressure, weight gain.

The researcher adopted a quantitative approach with two group pre test and post test design. The study was done on 60 patients undergoing hemodialysis in Sree Mookambika Medical College Hospital. In this study, the independent variable is the intradialytic stretching exercise and dependent variable is the level of muscle cramps. The subjects were selected by purposive sampling technique and were collected from two groups of patients, 30 were allotted in experimental group and 30 in control group.

The tool used for the study was modified muscle cramp assessment tool and the check list carrying symptoms of muscle cramps. Pre test was conducted in experimental and control group on the first day by using the tool. Intradialytic stretching exercise was given to the experimental group for 30 days in 8 sessions. Post test was conducted to the experimental and control group. The collected data were analyzed based on descriptive and inferential statistics according to the above mentioned objectives.

The study identified that level of muscle cramps was reduced in both experimental group and control group. It was found that there was a significantly high reduction in the level of muscle cramps in experimental group after intradialytic stretching exercise than in the control group. The 't' value of difference of mean reduction of muscle cramps tabulated was found to be $t = 36.5^*$, $df = 58$, $p < 0.05$.

Study Findings

The pretest of experimental and control group revealed that there was no significant difference. Both experimental and control group were similar in respect of demographic variables and thus it was observed that they were identical.

The study identified that the level of muscle cramps was reduced in experimental group. It was found that there was a significant reduction in the level of muscle cramps of experimental group after intra dialytic stretching exercise than in control group. The 't' value of difference of mean reduction of muscle cramps tabulated was found to be $t = 36.5^*$, $df = 58$, $p < 0.05$.

The study also shows that there was an association between the level of muscle cramps and age group.

Conclusion

The conclusion drawn from the findings of the study are as follows:.

1. Intra dialytic stretching exercises are found to be an effective nursing intervention in reducing muscle cramps among patients undergoing hemodialysis.
2. Intra dialytic stretching exercises are found to have no side effects when compared with other pharmacological therapies.
3. Patient's satisfaction is very much higher in this intervention.

4. The findings of the study enlighten the fact that intra dialytic stretching exercise can be used as a cost effective nursing intervention in reducing the muscle cramps.
5. The results showed that there is an association between the level of muscle cramps and age.

Nursing Implications

Muscle cramps are a common complication of hemodialysis treatments, occurring in 33 to 86 percent of patients. They often result in the early termination of a hemodialysis session and therefore a significant cause of under dialysis. In the present scenario people prefer to conservative treatment and alternative therapies than pharmacological therapy. Now with today's growing emphasis in treatment and cost effectiveness, exercises are receiving more widespread intervention which is cheap, effective and has no side effects. Intra dialytic stretching exercises improve circulation and provide physiological and psychological relaxation and reduce muscle cramps. The present study proves the effectiveness intra dialytic stretching exercise in reducing muscle cramps, therefore the findings of the study have considerable implications on nursing administration, nursing practice, and nursing research.

Implication To Nursing Administration

Health care systems are likely to face more problems in the present days. The nurse administrator should keep the following words in mind. We cannot continue doing what we have always done. Tomorrow cannot be just same of yesterday. We need flexibility and pragmatism as much as innovation. Nurse administrator can serve as a communicator, motivator to treat carefully and to achieve the requisite

enthusiasm and success in order to meet the growing needs of suffering humanity by taking real step to implement exercise along with existing treatment schedule.

1. The study helps the nurse administrator to assess the knowledge of nurses regarding non pharmacological measures in reducing muscle cramps among hemodialysis patients.
2. The result of the study encourages the nurse administrator to conduct in service education program on various types of exercises in reducing muscle cramps among hemodialysis patients.
3. Nurse administrator can prepare a protocol regarding each exercise sessions to develop and provide an effective non pharmacological measure for reducing muscle cramps among hemodialysis patients.
4. Nurse administrator can see that the nursing services are organized and administered in such a way that quality of nursing care maintained.
5. The nurse administrator can create awareness among nurses that intra dialytic stretching exercise is a very good, simple and cost effective nursing intervention to relieve muscle cramps among hemodialysis patients.

Implication To Nursing Education

To help, to heal, to reconstruct and to comfort and all along the line to act with compassion – all these bear testimony to the moral consciousness of the professionals. The nurse educator can arrange the nurses for teaching non pharmacological therapies to patients. The nurse educator can take steps to make the

staff in the nursing field aware regarding the touch and feel techniques which gain more popularity now.

1. Nurse educator can train and encourage the student nurses to implement exercises as a non pharmacological measure in reducing muscle cramps among hemodialysis patients.
2. This study can motivate student nurses to explore new strategies for effective relief of muscle cramps.
3. This research report can be kept in library for reference of nursing personnel , students , and other health care professionals.
4. The nurse educator can take independent decision on principles of healthcare.

Implication To Nursing Practice

Nurses play a vital role in enhancing and maintaining the health of other people. Since the experience of pain during cramps is a dynamic, the nurse has a responsibility to understand the pain experienced by dialysis patients during cramping. Effective pain management not only reduces physical discomfort, but also improves quality of life and promotes earlier relief and reduces health care costs.

1. Performance of intra dialytic stretching exercise is a safe and better modality which brings a higher level of satisfaction for patients.
2. This intervention could bring benefits to patients who are taking other pharmacological measures to get relief from muscle cramps.

3. It also brings a long term effect and higher level of reduction of muscle cramps, thus patients feel better and can avoid complications.
4. It is one of the simple and effective nursing intervention to reduce muscle cramps.

Implications To Nursing Research

A great deal of the responsibility for research utilization rests in the hands of researchers. There is little point in doing research if the results do not get used, so it behooves researchers to take steps to ensure that can occur. The present period is unfolding many skills in every area to the hospital system efficient and effective, A lot of research is being undertaken at various places. But these do not reach to most of the hospital personnel and thus the benefits of new knowledge are never translated in practice. The research implication of the study lies in the scope for expanding the quality of nursing service. In this era of evidenced based practice, publication of these studies will take nursing to a new horizon.

1. Nurse researcher can do various studies related to effectiveness stretching exercise on elderly population in reducing nocturnal leg cramps.
2. A comparative study can be done to determine the effectiveness of stretching exercise with other therapies.
3. Nurse researcher can do studies related to other beneficial effects of stretching exercises
4. Similar study can be conducted on a large sample so it could be generalized

Limitation

1. The sample size of patients for the experimental and control group was only 30 and hence generalization was not possible.
2. The data collection period was only 1 month.
3. Extraneous variables were controlled to some extent only.

Recommendations

1. The study may be replicated with randomization in selection of a large sample.
2. Nurse researcher can do studies related to other types of non pharmacological therapies in reducing muscle cramps.
3. A study can be conducted by including more number of variables and at different geographic locations.
4. The study can be conducted to determine the other therapeutic benefits of stretching exercises among hemodialysis patients.

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APPENDIX A



SREE MOOKAMBIKA COLLEGE OF NURSING

(Approved by the Government of Tamil Nadu & Recognised by Indian Nursing Council,
New Delhi, Tamil Nadu state Nurses & Midwives Council, Chennai.)
Affiliated to The Tamil Nadu Dr. M.G.R. Medical University, Chennai.

PADANILAM WELFARE TRUST, V.P.M.HOSPITAL COMPLEX, PADANILAM,
KULASEKHARAM, K.K.DIST., TAMIL NADU, PIN : 629 161.
Phone : 04651 - 280743, 280866, 280742, 280745

ETHICAL COMMITTEE CLEARANCE

To

Date :

Lr. No. **11.01.2014**

Mrs. Sahaya Hestrin .S

I Yr. M.Sc (N),

Sree Mookambika College of Nursing,

Kulasekharam.

Ref : Research Topic: A Study to assess the effectiveness of intra dialytic stretching exercise on muscle cramps among Hemodialysis patient at Sree Mookambika Medical College Hospital, Kulasekharam, Kanyakumari District.

Sub : Approval of the above reference study and its related documents

Dear Sahaya Hestrin . S

Ethics committee of Sree Mookambika College of Nursing , Kulasekharam reviewed and discussed the study proposal documents submitted by you related to the conduct of the above referenced study and its meeting held on 11.01.2014

The Following ethical committee Members were present at the meeting held on 11.01.2014

NAME	PROFESSION	POSITION IN THE COMMITTEE
Prof. Mrs. Shanthi Letha	Nursing	Chair Person
Dr. Kani Raj Peter	Medical	Basic Medical Scientist
Dr. T.C. Suguna	Nursing	Clinicians
Adv. Mohanan	Legal	Legal Expert
Prof. Mrs. Ajitha Rethnam	Nursing	Member Secretary
Dr. Preetha P.Nair	Management	Philosopher
Mr. Natarajan	Social	Medical Social Worker
Mrs. Latha	Lay Person	Community Person

After due ethical and scientific consideration, the Ethics committee has approved the above presentation submitted by you.

Regards,

Mrs. SANTI LETHA PhD (N)

Date : 11.01.2014

Ethics Committee – Chairperson,

Place : Kulasekharam.

Sree Mookambika College of Nursing,

V.P.M. Complex, Padanilam, Kulasekharam.

APPENDIX B



SREE MOOKAMBIKA COLLEGE OF NURSING

PADANILAM WELFARE TRUST, V.P.M.HOSPITAL COMPLEX, PADANILAM,
KULASEKHARAM, K.K.DIST., TAMILNADU, PIN : 629 161.

Phone : 04651 - 280745, 280742, 278250

(Approved by Govt. of The Tamil Nadu & Recognised by Indian Nursing Council, New Delhi)

Date :

Lr. No :

LETTER SEEKING EXPERT OPINION FOR TOOL VALIDITY

Date :

To

Madam / Sir

Sub : M.Sc Nursing Programme – dissertation – Validation of study tool request –reg:

Ms/Mrs **Sahaya Hestrine.S** a bonafide if II Year M.Sc Nursing student of Sree Mookambika College of Nursing is approaching you to obtain validation of study tool pertaining to her dissertation in practical fulfillment of the requirement for the degree of Master of Science in Nursing. **The selected topics is A study to assess the effectiveness of intra dilating stretching exercises on muscle cramps of patients undergoing haemodialysis in Sree Mookambika College of Nursing, Kulasekharam.** In this regard I request you to kindly extent possible technical guidance and support for successful completion of dissertation.

I enclosed here with a check list for your evaluation.

Thanking You

Yours Sincerely


PRINCIPAL
PRINCIPAL
Sree Mookambika College of N
Kulasekharam.

APPENDIX C**PERMISSION LETTER FOR DATA COLLECTION**

From

Sahaya hestrin.S
Sree Mookambika college of nursing
Kulasekaram

To

The Director
(Through principal)
Sree Mookambika College of Nursing
Kulasekaram

Respected Madam,

I Mrs. Sahaya hestrin, wants to conduct a project as a part of our M.Sc Nursing programme. My project topic is **“A study to assess the effectiveness of stretching exercise on muscle cramps among hemodialysis patients at Sree Mookambika medical college hospital, Kulasekaram”** My data collection period is from (4-5-2015 to 4 – 6- 2015).So I humbly request you to grant me permission to do my project in our hospital.

Thanking You

Yours faithfully
S.Sahaya Hestrin.S

APPENDIX D**LIST OF EXPERTS FOR TOOL VALIDATION****1. Dr. Thilakar, MD**

Asst. Professor, Department Of Medicine,
Sree Mookambika Medical College Hospital,
Kulasekharam .

2. Dr.Mrs.Sharmila Jansi Rani Ph.D(N)

Professor
Christian College of Nursing
Neyoor

3. Mrs.Sheeba, M.Sc. (N)

Professor
Christian Collge of Nursing
Neyoor

4. Mrs. Moona, M.Sc. (N),

Professor,
Christian College Of Nursing
Neyoor.

5. Mrs. AmuthuM.Sc(N)

Vice principal,
P.S College of Nursing,
Thalakulam.

APPENDIX E**EVALUATION TOOL CHECK LIST**

Name of the expert :

Designation :

College :

Respected Madam / Sir,

Kindly go through the content and the place the right () marks against the check list in the following columns ranking from relevant to non – relevant. Where ever there is a need for modification, kindly give your opinion in the remarks column.

SECTION : A

Demographic Variables

ITEM NO	RELEVANT	NEEDS MODIFICATION	NOT RELEVANT	REMARKS
1				
2				
3				
4				
5				
6				
7				
8				

SECTION : B

Check List

ITEM NO	RELEVANT	NEEDS MODIFICATION	NOT RELEVANT	REMARKS
1				
2				
3				
4				
5				
6				
7				
8				
9				

APPENDIX F**DATA COLLECTION TOOL****Section - A****Demographic Variable**

1. Age
(a) 25 - 35 years (b) 36 - 45 years (c) 46 - 55 years (d) 56 – 65 years
2. Sex
(a) Male (b) Female
3. Duration of Dialysis
(a) 1 year (b) 2 years (c) Maintenance
4. Practice of physical exercise
(a) Regular (b) Irregular
5. Frequency of Dialysis
(a) Once in a week (b) Twice a week (c) Three times in a week

Clinical Variables

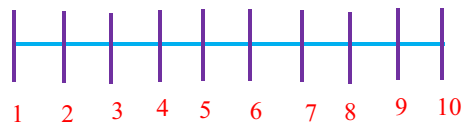
1. Serum Creatinine (mg/Dl)
(a) 0 - 5 (b) 5.1 - 10 (c) 10.1 - 15
2. Pulse Pressure (mm/Hg)
(a) 5-50 (b) 55 – 100 (c) 105 - 150
3. Weight Gain (Kg)
(a) 1 - 2 (b) 2 - 3 (c) 3 – 4 (d) More than 4

Section - B

Characteristics of Muscles cramps

Intensity by modified numerical Rating Scale

S.NO	SCALE READINGS	DESCRIPTION	SCORE
1	1 – 3	Mild	1
2	4 – 7	Moderate	2
3	8 – 10	Severe	3



Duration

S.NO	ITEMS	SCORE
1	Less than two minutes	1
2	Two to five minutes	2
3	More than five minutes	3

Frequency :

S.NO	ITEMS	SCORE
1	Less than two times	1
2	Two to three times	2
3	More than three times	3

Total scoring for the three parts of leg cramp assessment tool:

Total maximum possible score : 9

Total minimum possible score : 3

SNO	ITEMS	SCORING
1	Mild leg cramps	1-3
2	Moderate leg cramps	4 – 6
3	Severe leg cramps	7- 9

Check List for signs and symptoms of Muscle cramps

S.No.	Symptoms	Yes	No	Remarks
1	Numbness of the cramped limb			
2	Difficulty to lift up the cramped limb			
3	Feeling hard to touch			
4	Tingling sensation			
5	Tightness of the muscles of the affected limb			
6	Difficulty to flex the affected limb			
7	Stiffness at the toes of the cramped limb			
8	Severe pricking pain			
9	Loss of sensation over the affected leg			

SCORE:

S.NO	ITEM	DESCRIPTION	SCORE
1	Symptoms (1-3)	Mild cramps	1
2	Symptoms (4-6)	Moderate cramps	2
3	Symptoms (7-9)	Severe cramps	3

APPENDIX G

DATA COLLECTION PROCEDURE

Intra Dialytic Stretching Exercise

It means, the exercises performed by the investigator for the gastrocnemius and soleus muscles of the patient for 15 minutes during the second hour of hemodialysis. All the patients undergone 2 session of exercise therapy per week for one month. The steps involved are,

Step 1: Flex the toes up ward

In a normal sleeping position with the patient's knees slightly bent and the toes pointing down shortens the calf muscles, making them prone to contraction. Flex and point the toes, holding each position for about 5 seconds. Repeat for 30 seconds to 1 minute.



Step 2: Massaging the calf muscle

Sit with cramped leg crossed over the other thigh and massage the muscle gently for 5 minutes.

**Step: 3 Hip and knee flexion and extension**

In a normal sleeping position, flex and extend the knee joint for about 5 minutes.



