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Effectiveness of Intradialytic Stretching Exercises on Muscle Cramps among Patients Undergoing Haemodialysis in a Selected Tertiary Care Hospital Kancheepuram District, Tamil Nadu, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Chronic kidney disease is the vital and non-communicable disease epidemic that affects the world population including India. Muscle cramps are a common complication of haemodialysis treatments and they often result in the early termination of the session, it is an important priority to provide timely intervention to improve their muscle cramps of haemodialysis patients.
Materials and Methods: The aim of the study is to evaluate the effectiveness of intradialytic stretching exercises on muscle cramps among patients on haemodialysis. Time series quasi experimental design was conducted in dialysis unit of Chettinad Super Specialty Hospital, Kelambakkam at Chengalpet District, Tamil Nadu, India.Total sample of 138 belong to 30 to 60 years were selected with the use of purposive sampling technique as per the statistical calculation and equally allocated to control 69 samples and to Study group 69. The structured questionnaire are demographic, Clinical variables & Modified cramps questionnaire chart was used to assess the effectiveness of intradialytic stretching exercises on level of muscle cramps.

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Results: The study findings concluded that in pre test 41(59.4 %) of the patients in study group and 38(55.1 %) of the patients in control group had mild muscle cramps whereas in post test 4(5.8 %) of the patients in study group had severe muscle cramps and 16 (23.2 %) of the patients in control group had severe muscle cramps. While comparing the post test mean value of control group 2.652±0.854 the study group mean value was 2.101±0.769 was significantly reduced with't' value of 10.185 at p ≤ 0.000. Therefore the Research hypothesis H_1 was retained. Hence there was no significant association between the test scores on intensity of muscle cramps among patients undergoing haemodialysis with selected demographic and clinical variables of group 2 (study) at P ≤ 0.000 level. Therefore the Research hypothesis H2 was rejected.The majority finding of the study results that in pre test 32 (46.4 %) of the patients were in mild muscle cramps in post test 1.More than half of the patients 30 (43.5 %) of moderate muscle cramps in post test 2. And majority 40 (58 %) of the patients in moderate muscle cramps in post test 3.The effect of intradialytic stretching exercises in reducing the level of muscle cramps during haemodialysis.
Conclusion: Intradialytic stretching exercises is an effective method which can be used as a preventive therapy in the treatment of muscle cramps.

Keywords: Haemodialysis; intradialytic stretching exercises; muscle cramps; effectiveness.

1. INTRODUCTION

Chronic kidney disease is an emerging worldwide public health problem [1]. Pathogenesis of chronic kidney failure challenges the functions of human body and puts irreversible progressive damage to renal mass and causing metabolic and hydro electrolytic imbalances [2]. "The overall global prevalence of CKD increased from 147, 598, in 1990 to 275,929,799.20 in 2016, representing an 86.95% increase in prevalence over the last 27 years" [3]. Haemodialysis is one of the universal treatments for patients with chronic renal failure. Manifold of complications can occur throughout hemodialysis treatment such as nausea, vomiting, back pain, Headache, hypotension and muscle cramps. Among these muscle cramps are the most notable complication of haemodialysis treatment [4]. 33% to 86 % of patients had the complaints of muscle cramps during haemodialysis [5]. Muscle Cramps occur suddenly and last from a few seconds to several minutes. Cramps influence calves, arms, hands, abdominal muscles and particularly lower limps [6,7]. The severity of cramps occurring with dialysis treatment dreadfully high and as a result it has a significant negative impact on health-related quality of life. In some patients, it can be severe enough to cause termination of Haemodialysis [8].

Muscle Cramps commonly occurs during the end of the haemodialysis [9] muscle cramps begin with fasciculation's or muscle twitches and are felt to be related to nerve conduction rather than the muscles themselves [10]. Copious factors such as volume contraction, hypotension, and changes in plasma osmolality, hyponatremia, tissue hypoxia, hypomagnesaemia, and elevated serum leptin influence the muscle cramps for patients undergoing haemodialysis. Painful contraction of the muscle could make psychological impact, yet Cramps have a trivial impact on patient's mood and quality of life which cause depression and contribute to lack of sleep .Non- pharmacological therapy forms the keystone of the management of muscle cramps.

Non- pharmacological therapy forms the keystone of the management of muscle cramps. It is important to discuss non-pharmacologic strategies to prevent and treat muscle cramps with patients in order to minimize pharmacotherapy. Local massage and the application of moist heat on affected muscle may provide comfort**.**

2. MATERIALS AND METHODS

2.1 Research Approach and Design

Quantitative evaluative approach was followed, Time series quasi experimental design was found suitable for the study.

2.2 Research setting

The study was conducted in dialysis unit of Chettinad Super Specialty Hospital, Kelambakkam at Chengalpet District, Tamil Nadu.

2.3 Population

Total sample of 138 belong to 30 to 60 years were selected with the use of purposive sampling

technique as per the statistical calculation and equally allocated to control 69 samples and to Study group 69. More than 20% to 62% of people reported muscle cramps during dialysis and 1/3 of the patients over 60 years and half of the patients over 80 years affect from muscle cramps at rest. Picchietti D et al., (2001) stated that forty four percent of population with muscle cramps has more than three episodes per week and 6% have episodes at least once every 24 hours.

2.4 Sample

In the present study the sample consists of the patients with muscle cramps while undergoing haemodialysis and who met inclusion criteria.

2.5 Criteria for Sample Selection

2.5.1 Inclusion criteria

- Patients who are in the age group of 30 to 60 years
- Patients belong to male, female and trans gender
- Patients undergoing haemodialysis three times per week with muscle cramps.
- Patients who can understand Tamil or English language.

2.5.2 Exclusion criteria

- Patients undergoing emergency haemodialysis.
- Patients on first cycle of haemodialysis.
- Patient s with femoral catheter
- Patients with any lower limb disability

2.6 Sample Size Estimation

The sample size was calculated by using this formula:

Sample size: β n = 2^2 [$Z\alpha/2$ + Z^2/ $d^{2]}$ α = Standard deviation.

$Z\alpha/2$ = Confidence interval of level of significance at 5% (0.05) = 1.96
$Z\beta$ = Power of the test of critical region is 80% are 0.84 d = Margin of error
At an attrition rate of 5% for each group, allowable error will be = 10%
$n = 2(5.12)^2[1.96+0.84]^2/2.5^2$
=52.4 (7.84)/(2.5)2
= 410.8/6.25
= 65.72 + 3.2
= 68.92

2.7 Sampling Technique

All patients who met the inclusion criteria were selected by using the purposive sampling technique.

Research tool: The research tool consisted of two sections

Section A: Questionnaire to collect demographic and clinical variables.
Section B: Tool to assess muscle cramps.

Part I: Demographic Variables: It includes age, gender, education and occupation of the patient.
Part II: Clinical variables: It includes, duration of haemodialysis treatment, experience of muscle cramps during haemodialysis, muscle cramps restrict activities and movements during haemodialysis, location of muscles cramps, muscles involved in cramps, co morbid illness.

Section C: Tool to assess muscle cramps.

Cramp questionnaire chart was used to assess the muscle cramps. The cramp questionnaire chart developed by Base math.S.S.Morris, permission was obtained. The cramp questionnaire chart designed to assess the level of muscle cramps during haemodialysis, before and after intervention. It contains various features of muscle cramps such as the frequency of muscle cramps, duration of muscle cramps, and level of pain, temperature and discomfort which was comprehensively scored as level of muscle cramps ranging from (0-13). An intradialytic Stretching exercises is an outstanding way of preparing the locomotors system for muscular efforts: they progress the movement capacity by rising the muscular elasticity and they help soothe the tiredness produced after an excessive training during the dialysis procedure.

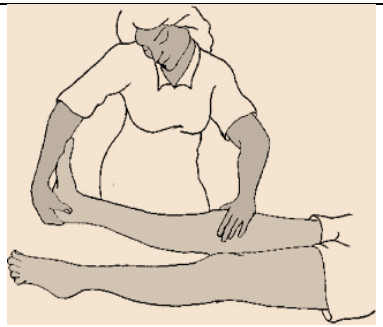
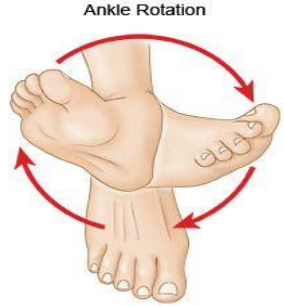
Details of pre test & post test (Intervention)

On the first day pre test was conducted to group 1 (control) and group 2 (study). Intradialytic stretching exercises was formed in which flexion, extension and rotation of ankle of both legs in clockwise and anti clockwise direction for 15 minutes and stretching of the calf muscles for 5 times during haemodialysis. Implementation of Intradialytic stretching exercises at the end of second hour of haemodialysis in a frequency of twice per day between 3^{rd} and 4^{th} hour for three days. Post test was assessed at the end of first

Table 1. Research design

GROUPs	PRETEST O1 1st day	INTERVENTION			POST TEST		
		X_1 1st day	X_2 2nd day	X_3 3rd day	O2	O3	O4
Group 1 (Control)	Day 1	Routine treatment			1st day	2nd day	3rd day
Group 2 (Study)	Day 1	Implementation of intradialytic stretching Exercises			1st day	2nd day	3rd day

Chart 1. Procedure for Intradialytic stretching exercises

S. no	Exercise	Description	Picture
1.	Calf stretch	Patient in supine position. Place the non dominant hand over the knee to support and stabilize the knee. Place the dominant hand under the ball of the foot against the forearm, and push the heel downward with this hand and stretching the calf muscles in the back of the leg for 5 times during hemodialysis.	
2.	Ankle circle	Patient in supine position. Place the non dominant hand over the calf to stabilize the knee. Place the dominant hand under the heel to stretch the second muscle (the soleus) flexion, extension and rotation of ankle of both legs in clockwise and anti clockwise direction for 15 minutes.	

day, 2nd and 3rd day during haemodialysis for group 2 (study). Stretching exercise was implemented only for group 2 (study). Group 1 (control) received the routine care.

2.8 Data Analysis

The data was analyzed and interpreted by descriptive and Inferential statistics by using SPSS-20 software. Descriptive analysis Frequency and percentage used for describing demographic and clinical variables. Mean and standard deviation used and Inferential Statistics Paired't' test used to find out the effectiveness of intradialytic stretching exercises by comparing pre test and post test on muscle cramps among patients undergoing haemodialysis. Chi square test used to find out an association between the post tests levels of muscle cramps with selected demographic and clinical variables among patients undergoing haemodialysis.

3. RESULTS AND DISCUSSION

This study was carried out to assess the Effectiveness of Intradialytic Stretching Exercises on Muscle Cramps among Patients Undergoing Haemodialysis in a Selected Tertiary Care Hospital Kancheepuram District, Tamil Nadu, India. Since the p-value was small (< 0.05) the findings to the acceptance of the hypothesis that there was a significant reduction in muscle cramps after performance of intradialytic stretching exercises.

Among 69 of the patients having muscle cramps majority 32 (46.4 %) of the patients were in mild muscle cramps in post test 1. More than half of the patients 30 (43.5 %) of moderate muscle cramps in post test 2. And majority 40 (58 %) of the patients in moderate muscle cramps in post test 3. The results revealed that the effect of intradialytic stretching exercises in reducing the level of muscle cramps during heamodialysis. The study supported by Lekha. J (2016) conducted on performing intradialytic stretching exercises reduces the level of muscle cramps were statistically significant with the level of significance at p<0.05. The data shows that there was no significant difference between the intradialytic stretching exercises and the routine treatment during the post test I, 11 and 111 [11]. The reduction of Muscle Cramps from pre test to post test, the mean was 9.8 to 3.5 and in standard deviation 1.62 to 1.51. The mean difference was statistically significant [t =30.34 df = 59 and P < 0.05]. The study results shows that intradialytic stretching exercise was effective in reducing Muscle Cramps during dialysis.

The present study results shows that percentage distribution of age revealed that in Group 1 majority 21 (30.4 %) of the patients belong to 41-49 years, group 2 23 (33.4 %) of the patients above the same years. The study was supported by Sasirekha. C (2017) who conducted a study to assess effectiveness of intradialytic stretching exercise on muscle cramps among patients undergoing hemodialysis at selected hospitals, Salem. The study results revealed that majority 10(33.34 %) of the patients were experimental group between the age group of 41-50 years [12].

In group 1 nearly half of the male patients 54 (78.3 %), education 16 (23.2 %) of the patients secondary education, and occupation 51 (73.9 %) of the patients unemployed comparing group 2 male majority 45 (65.2 %) of the patients, education 17 (24.6 %) of the patients secondary education, occupation 46 (66.6 %) of the patients unemployed. The presents study was supported by Sasirekha. C (2017) who conducted a study to assess effectiveness of intradialytic stretching exercise on muscle cramps among patients undergoing hemodialysis at selected hospitals, Salem. In gender revealed that nearly half of the male majority 18 (60 %) of the patients were experimental group 20 (66.66 %) of the patients were control group([12]). The present study supported that Lekha. J (2016) conducted a effectiveness of intradialytic stretching exercises on prevention and reduction of muscle cramps among patients undergoing hemodialysis at psg college of Nursing, Coimbatore. The results revealed that majority 16 (53.3 %) of the patients were secondary education in intervention group, the majority 15 (50 %) of the patients were suffered unemployed in intervention group and 21 (70 %) of the patients unemployed in camparison group [11].

Percentage distribution duration of dialysis treatment revealed that majority 32(46.3 %) of the patients are group 1 and 31(44.9 %) of the patients are group 2 belong to ≥ 2 years, experience of muscle cramps during hemodialysis majority 33(47.8 %) of the patients in group 1 and 28 (40.6 %) of the patients in group 2 from the last hour. Muscle cramps restrict activity and movements during hemodialysis majority 45(65.2 %) of the patients were in group 1 and 44 (63.8 %) of the patients were in group 2 feeling says that yes. Location of

Table 1. Frequency and percentage distribution of demographic variables in both groups N=138

S.NO	Demographic Variables	Group 1 control (n=69)		Group 2 study (n=69)		X^2	P value
		f	%	f	%		
1	Age in years						
	30-39	16	23.3	15	21.6		
	41-49	21	30.4	23	33.4	0.280	0.963
	50-59	17	24.6	15	21.6		NS
	≥ 60	15	21.7	16	23.4		
2.	Gender					2.895	0.088
	Male	54	78.3	45	65.2		NS
	Female	15	21.7	24	34.8		
3.	Education						
	No formal education	13	18.8	11	15.9		
	Primary	15	21.7	12	17.4	0.827	0.934
	Secondary	16	23.3	17	24.6		NS
	higher secondary	12	17.4	14	20.3		
	Graduate & Post graduate	13	18.8	15	21.8		
4.	Occupation						
	Skilled worker	5	7.3	6	8.8		
	Unskilled worker	13	18.8	17	24.6	0.882	0.643
	Unemployed	51	73.9	46	66.6		NS

P at 0.05 level

Table 2. Frequency and percentage distribution of patients according to their Clinical variables in group 1& 2 N=138

S. No	Variables	Group 1 control (n=69)		Group 2 Study (n=69)		X^2	P value
		f	%	f	%		
1.	Duration of your haemodialysis treatment						
	3- 12 months	23	33.3	20	28.9		
	1-2 years	14	20.4	18	26.2	0.725	0.695
	> 2 years	32	46.3	31	44.9		NS
2.	Experience the muscle cramps during haemodialysis						
	First hour	14	20.3	19	27.5		
	Middle hour	22	31.9	22	31.9	1.167	0.557
	Last hour	33	47.8	28	40.6		NS
3.	Muscle cramps restrict activities and movements during heamodialysis						
	Yes	45	65.2	44	63.8	0.031	0.858
	No	24	34.8	25	36.2		NS
4.	Location of muscle cramps						
	Right leg	31	44.9	34	49.3		
	Left leg	31	44.9	22	31.9	3.466	0.176
	Both legs	7	10.2	13	18.8		NS
5.	Muscles involved in Cramps						
	Calf muscle	34	49.3	41	59.4		
	Hamstring muscle	24	34.8	19	27.5	1.434	0.488
	Soleus muscle	11	15.9	9	13.1		NS
6.	Co morbid illness						
	Systemic hypertension	52	75.4	49	71.0	0.332	0.564
	Diabetes Mellitus with Systemic Hypertension	17	24.6	20	29.0		NS

P at 0.05 Level

Table 3. Frequency and percentage distribution of Intradialytic stretching exercises on level of muscle cramps among patients undergoing haemodialysis in group 1 and Group 2

SNO.	Level of muscle cramps	Interpretation	Group 1 control (n=69)								Group 2 study (n=69)							
			Pre test		Post test 1		Post test 2		Post test 3		Pre test		Post test 1		post test 2		Post test 3	
			f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
1	1	No cramps	3	4.3	2	2.9	4	5.8	1	1.4	0	0	2	2.9	5	7.2	13	18.8
2	2-4	Mild cramps	10	14.5	14	20.3	16	23.2	38	55.1	9	13.0	12	17.4	18	26.1	40	58.0
3	5-8	Moderate cramps	18	26.1	21	30.4	19	27.5	14	20.3	19	27.5	23	33.3	30	43.5	12	17.4
4	9-13	Severe cramps	38	55.1	32	46.4	30	43.5	16	23.2	41	59.4	32	46.4	16	23.2	4	5.8

Table 4. Effectiveness of Intradialytic stretching exercises on level of muscle cramps among patients undergoing haemodialysis in Group 2

Parameter	Group	Pretest		3rd POST TEST		Mean Difference	t Value	P Value
		Mean	SD	Mean	SD			
Level of Muscle Cramps	Group 2	3.464	0.719	2.101	0.769	1.362	10.185	0.000 S

S-significant

Table 5. Comparison of Intradialytic stretching exercise on level of muscle cramps among patients undergoing hemodialysis in group 1 and group 2

42

Sl. No	Groups	Post test		Mean difference	Calculated 't' value	P Value
		Mean	SD			
1	Group 1	2.652	.854	0.666	5.002	0.000
2	Group 2	2.101	.769	1.362	10.185	0.000

*Statistically Significant-*p<0.000*

Table 6. Association of post test level of muscle cramps with selected demographic variables of patients undergoing haemodialysis in group 2 N=138

S.no	Demographic variables	No cramps	Mild cramps	Moderate cramps	Severe cramps	Chi square Value	P Value
		f (%)	f (%)	f (%)	f (%)		
1	Age in years						
	30-40	3(4.34)	8(11.59)	4(5.79)	0(0)		
	41-50	4(5.79)	13(18.88)	3(4.36)	3(4.34)	2.433	0.983
	51-60	3(4.34)	9(13.06)	2(2.89)	1(1.45)		NS
	≥ 60	3(4.34)	10(14.49)	3(4.34)	0(0)		
	Gender						
	Male	10(14.49)	27(39.15)	5(7.26)	3(4.34)	2.510	0.473
2	Female	3(4.34)	13(18.84)	7(10.14)	1(1.44)		NS
3	Education						
	No formal education	1(1.45)	7(10.14)	1(1.45)	2(2.89)		
	Primary	1(1.45)	5(7.24)	4(5.79)	1(1.45)		
	Secondary	7(10.15)	8(11.59)	2(2.89)	0(0)	9.400	0.668
	Higher secondary	4(5.79)	9(13.08)	2(2.89)	0(0)		NS
	Graduate & Post graduate	0(0)	11(15.96)	4(5.79)	0(0)		
4	Occupation						
	Skilled worker	2(2.89)	3(4.34)	1(1.45)	0(0)		
	Unskilled worker	5(7.26)	10(14.49)	1(1.45)	1(1.45)	2.951	0.815
	Unemployed	6(8.69)	27(39.15)	10(14.49)	3(4.34)		NS

NS – Not Significant

Table 7. Association of post test level of muscle cramps with selected Clinical variables of patients undergoing haemodialysis in group 2

S.no	Clinical variables	No cramps	Mild cramps	Moderate cramps	Severe cramps	Chi square Value	P value
		f (%)	f(%)	f(%)	f(%)		
1.	Duration of dialysis treatment						
	3 -12 month	0(0)	4(5.79)	1(1.48)	0(0)		
	1-2 years	5(7.23)	9(13.04)	3(4.37)	1(1.46)	2.735	0.841
	≥ 2 years	8(11.57)	27(39.12)	8(11.59)	3(4.35)		NS
2.	Experience the muscle cramps during haemodialysis						
	First hour	2(2.89)	12(17.39)	4(5.79)	1(1.48)		
	Middle hour	6(8.69)	10(14.49)	4(5.79)	2(2.89)	3.387	0.759
	Last hour	5(7.24)	18(26.08)	4(5.79)	1(1.48)		NS
3.	Muscle cramps restrict activities and movements during haemodialysis						
	Yes	10(14.49)	22(31.89)	9(13.04)	3(4.34)		0.365
	No	3(4.34)	18(26.08)	3(4.34)	1(1.48)	3.178	NS
4.	Location of muscle cramps						
	Right leg	5(7.26)	20(28.98)	8(11.59)	1(1.44)		
	Left leg	4(5.79)	11(15.95)	4(5.79)	3(4.37)	8.395	0.211
	Both leg	4(5.79)	9(13.04)	0(0)	0(0)		NS
5.	Muscles involved in Cramps						
	Calf muscle	6(8.69)	26(37.69)	7(10.15)	2(2.89)		
	Hamstring muscle	4(5.79)	8(11.59)	5(7.25)	2(2.89)	6.342	0.386
	Soleus muscle	3(4.37)	6(8.69)	0(0)	0(0)		NS
6.	Co morbid illness						
	Systemic hypertension	9(13.07)	28(40.58)	8(11.59)	4(5.79)		
	Diabetes mellitus with systemic hypertension	4(5.79)	12(17.39)	4(5.79)	0(0)	1.783	0.619 NS

NS- Not significant

Chart 2. Cramp Questionnaire Chart

S.NO	Feature of muscle cramps	Scores	Post test I	Post test II	Post test III
I	Frequency of cramps				
1	Does not occur	1			
2	Cramps occur less than 3 times /hour	2			
3	Cramps occur more than 3 times /hour	3			
II	Duration of the cramps				
1	Cramps does not occur	1			
2	Cramps lasts for less than 5 minutes	2			
3	Cramps lasts for more than 5 minutes	3			
III	Level of pain (VAS)				
1	No pain	1			
2	Pain 1-3	2			
3	Pain 4-6	3			
4	Pain 7-10	4			
IV	Temperature – Leg				
1	Warm	1			
2	Cold	2			
3	Cold /clammy	3			
V	Discomfort				
1	No cramps	1			
2	Perceptible	2			
3	Sensitive	3			
4	Painful	4			
5	Unbearable	5			

Score Interpretation:1 -No cramps; 2-4-Mild cramps; 5-8-Moderate cramps; 9-13-Severe cramps

Fig. 1. Box plot compares the post test -3 study and control group:

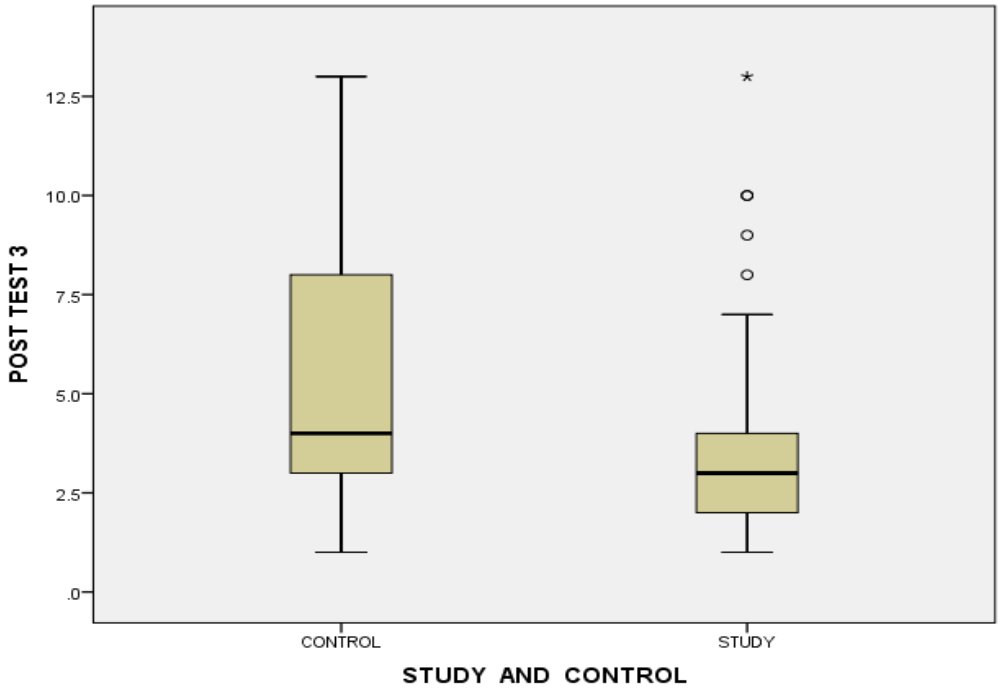


Fig. 1. The figure depicts that the thick middle is the median. Post test -3 mean score was reduced from 0.769 to 0.854 among study and control group

the muscle cramps majority 31(44.9 %) of the patients were suffered right and left leg in group 1 whereas majority 34 (49.3 %) of the patients were suffered only right leg in group 2. Most of the patients calf muscle involved in the majority 34 (49.3 %) of the patients were in group 1, 41 (59.4 %) of the patients were in group 2. Co morbid illness majority 52 (75.4 %) of the patients were in group 1, 49(71 %) of the patients were group 2. The study supported that Lekha. J (2016) conducted a effectiveness of intradialytic stretching exercises on prevention and reduction of muscle cramps among patients undergoing hemodialysis at psg college of Nursing, Coimbatore. The study results revealed that cramps occurred during hemodialysis majority 25(83.3 %) of the patients were intervention, 15 (50 %) of the patients were in comparison group suffered last hour. Muscle cramps restrict the activities and movements majority30 (100 %) of the patients were equal in both groups says that yes. Location of muscle cramps majority 13 (43.3 %) of the patients in intervention group, 12(40 %) of the patients in comparison group. Muscles involved in cramps majority 15(50 %) of the patients are intervention group, 21 (70 %) of the patients are comparison group. The results of the present study revealed that there were no statistical significant differences in demographic and clinical variables between the study and control groups which included age, gender, education, occupation, and duration of haemodialysis treatment, restrict activity and movements during haemodialysis, location of muscle cramps, experience of muscle cramps, muscles involved in cramps, co morbid illness [12].

During haemodialysis treatment most of the patients experience of muscle cramps. This study was taken up to assess the effectiveness of intradialytic stretching exercises to reduce the level of muscle cramps among patients undergoing haemodialysis at Chettinad Super Specialty Hospital, Kelambakkam Tamil Nadu, India.

4. CONCLUSION

Majority of the patients affected age belongs to 41-49 years 23(33.4 %) in group 2 (study), 21 (30.4 %) in group 1 (control). Mostly half of the patients male majority 45 (65.2 %) in group 2 (study) when comparing 54 (78.3 %) group 1 (control).

Nearly half of the patients secondary education 17 (24.6 %) in group 2 (study) whereas 16 (23.2 %) in group 1 (control). Majority of the patients occupation were unemployed 46 (66.6 %) in group 2 (study) when comparing to 51 (73.9 %) of the patients in group 1 (control). More than half of the patients experience the muscle cramps during hemodialysis in last hour 28 (40.6 %) in group 2 (study) whereas 33 (47.8 %) of the patients in group 1 (control). Majority of the patients locations of muscle cramps in right leg 34(49.3 %) in group 2 (study), which comprises of 31 (44.9 %) patients from the group 1 (control). Nearly half of the patients experienced muscle cramps in calf muscle 41(59.4 %) in group 2 (study) which comprises of 34 (49.3 %) of the patients from the n group 1 (control). Majority of the patients experienced severe muscle cramps during the pre test 41 (59.4 %). Intradialytic stretching exercises was implementing then post test score 4 (5.8 %) of the patients in group 2 (study).

The study was proven that intradialytic stretching exercises is an effective method which can be used as a preventive therapy in the treatment of muscle cramps. The study concluded that intradialytic stretching exercises can be performed regularly to reduce the level of muscle cramps among the patients undergoing haemodialysis.

6. LIMITATIONS

The researcher find out that there few limitations in the study. The limitations were as follows:

The data collection period for one month.

Only the participants who are having muscle cramps during haemodialysis period.

The study samples limitation about 138.

The study conducted only in one setting.

7. RECOMMENDATIONS

Based on the study findings, the following recommendations there are:

A similar study can be conducted with large samples.

Multi centric study can be conduct to evaluate.

A similar study can be conducted comparing two exercises.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The research proposal of this study was approved by the Institutional Human Ethical Committee of the Chettinad Academy of Research and Education on 541/IHEC/3.19 dated 10.09.2019.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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