Intradialytic Stretching Exercises on Muscle Cramps: A Systematic Review

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Abstract

Background: Muscle cramps are one among the common complications experienced by the hemodialysis patients. Sometimes the muscle cramps are so severe that the patients discontinue hemodialysis. Intradialytic stretching exercises are one of the non-pharmacological interventions used to treat muscle cramps. The objective of the study was to review the effectiveness and safety of Intradialytic stretching exercises on muscle cramps among hemodialysis patients.

Methods and Materials: A total of 130 research articles were reviewed in the (PubMed, Google Scholar, Cochrane library, Academia, Open access, Directory of open access journals) databases by using the keywords “muscle cramps”, Stretching exercises”, “hemodialysis” and Intradialytic exercises”. Based on the inclusion and exclusion criteria studies were sorted out and 15 studies were selected for the main analysis. The present systematic review was conducted following published guidelines for reporting systematic reviews and meta-analysis (PRISMA).

Results: It was found that most of the studies used quasi experimental, pretest posttest control group design and only three studies used true experimental designs. The sample size was between the range of 30 to 70 and there was not even a single study with sample size 100 and above. Majority of the studies used cramps assessment chart and pain assessments scales for data collection. All the studies concluded that intradialytic stretching exercises are effective interventions in reducing the muscle cramps among hemodialysis patients.

Index terms: muscle cramps, intradialytic stretching exercises, hemodialysis complications, end stage renal disease (ESRD), renal failure.

Introduction

Chronic kidney failure is progressively perceived as a worldwide general medical issue and key determinant of poor prognosis[1]. The last stage of chronic renal failure is known as end stage renal disease (ESRD). Hemodialysis and peritoneal dialysis are the common treatment modalities until the kidney transplantation[2]. The frequently experiencing symptoms by patients receiving hemodialysis are fatigue, muscle cramps, body aches and headaches[3].

ESRD is one of the growing non-communicable diseases around the world. In 2017, 1.2 million people died due to chronic kidney disease (CKD) throughout the world. The prevalence of CKD has grown by 29.3% since 1990. The patients receiving renal replacement therapy (RRT) surpasses 2.5 million and is anticipated to twofold to 5.4 million by 2030. In many nations, there is acute shortage of RRT services and an expected 2.3 to 7.1 million people have expired due to lack of accessibility to the therapy[4]. According to National Health Mission in India every year around 2.2 lakh fresh cases of ESRD are diagnosed. This has resulted in added need of 3.4 crore dialysis per year. Majority of the patients receive hemodialysis in center[5].

Muscle cramps are the most common symptom experienced by patients undergoing hemodialysis. The prevalence of muscle cramps range from 35 to 86%. The reason for intradialytic muscle cramps remains unknown. There are various pharmacological and non-pharmacological treatments available for muscle cramps, among them intradialytic stretching exercises is a non-pharmacological therapy[6]. The increased prevalence of muscle cramps among hemodialysis patients has attracted the researchers. Intradialytic stretching exercises is one of the interventions used to treat muscle cramps and numbers of researches are published in the journals to evaluate its effectiveness.

The objectives of the current systematic review was

1. To understand the research methodology used in the various studies.
2. To find out how the muscle cramps were assessed among hemodialysis patients.
3. To understand the data analysis methods used in the studies.
4. To understand the procedure of intradialytic exercises and its effect.

Methods and Materials

Literature Search: A systematic literature search was conducted from October 2019 to June 2020. The investigator searched the studies related to intradialytic stretching exercises on muscle cramps among hemodialysis patients. The outcome of the literature search was analyzed and confirmed in July 2020. Published thesis and articles from various journals were included in the review up to July 2020. The literature search was done by using national and international databases such as PubMed, Google Scholar, Cochrane library, Academia, Open Access, Science Direct and Directory of open. The keywords used to search the literature were “muscle cramps”, “stretching exercises”, “hemodialysis”, “ESRD”, and “Intradialytic complications”. Google search engine was also used to explore the open access publications. Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines was followed by the researcher to conduct the review.

Selection of Studies

Inclusion Criteria

- Articles published in peer reviewed journals.
- Articles written in English language.
- Open access thesis available on databases.
- Articles & thesis published from Jan 2015 to July 2020.

- Hemodialysis patients above 18 years of age.
- Quantitative studies.
- Experimental studies.

Exclusion Criteria

- Review articles
- Non experimental studies.
- Qualitative studies.
- Pediatrics hemodialysis patients.

The primary literature search resulted in 130 documents. Duplicate and irrelevant articles were removed. 33 articles were selected for careful and complete reading. A total of 15 full text articles were selected for review.

Systematic Review of Intradialytic Stretching Exercises on Muscle Cramps (2015 to 2020)

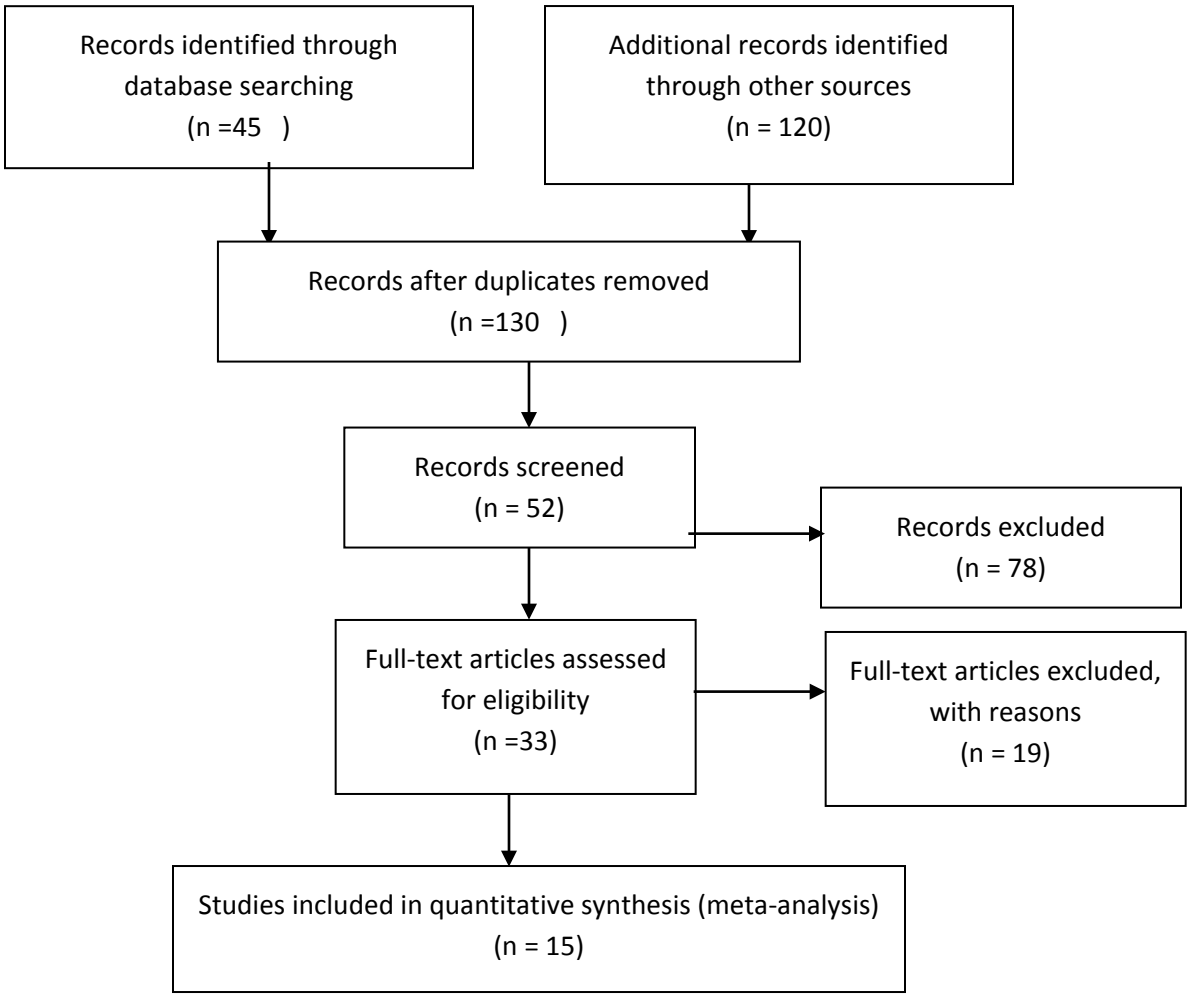

Figure-1- Systematic Review Flow Diagram.

Table- 1 Characteristics of Systematic Review Studies (2015-2020)

S.No	Published year	Journal Name	First author	Age range	Sample size/ Research Design/ Sampling technique	Setting	Reliabilty & validity	Data collection tool	Intervention	Result	Quality of article
1	Mar-2020	Assiut Scientific Nursing Journal	Asmaa Hassan Albadry	18-65 years	60 / pre test post test design	dialysis unit at Sohag University Hospital	Validity-5 experts Realibilty-cronbach's alpha coefficient (r=0.72).	(I): Structured Interview Questionnaire sheet (II) : Cramp questionnaire chart and visual analogue scale: Pre/ post test (III) : Fatigue severity scale (IV) : Intradialytic exercise	Time-20 minute, consited of 3 parts. Stretching exercises, Range of motion exercises and Isometric exercises. Teaching methods discussion, posters , handout, demonstration and redemonstration was used.	Statisctical significant diff in pre and post after implementation Stretching exercises	Good
2	2019	International Journal of Advances in Nursing Management	Kaur Lakhwinder	NA	60 / Quasi Exp./ purposive sampling technique	SGL hospital and India Kidney Hospital, Jalandhar, Punjab	NA	NA	NA	There was significant difference between mean posttest grade of muscle cramps in control and experimental group (tcal = 4.746 at p<0.05).	Medium
3	Oct-18	Thesis	Mr. Ravi R	20 to 60 years	30 / True exp. Design/ Simple random sampling technique-lottery method	Dialysis unit, Jeyasekharan Hospital, Kanyakumari	Sperman browns formula for reliability r 0.89 Experts Validated tool	Cramps Questionnaire chart Numerical pain intensity scale	Time-10-15 min, end of 1st hour stretching exercises was given of exp. Group and routine Rx was given to control group. For remaing 3 hours, characteristics of muscle cramps was assessed hourly.	The diff in cramps score was 5.4% in exp. Group and 1.9% in control group between day1 and day 3	Good
4	Oct-18	Thesis	A. Vimala	40 to 70 years	30 / Quesi Exp. One group Pre test post test design/ purposive sampling technique	dialysis unit of Sundaram Hospital Trichy	Karl Pearson's co- relation co-efficient r 0.93 and experts validated tool	Cramps Questionnaire chart Numerical pain intensity scale	Time- 20 min for 5 consecutive days. Post test was done everday after intervention.	calculated t value was 10.07. Mean pre test score was 11.1 and post test was 8.76.	Medium
5	Oct-18	Thesis	Tom Mathew	35 to 74 years	60 / Quesi Exp. Pre test postest control group design/ purposive sampling	MIMS THANAL dialysis centre, Vadakara Kerala	Karl Pearson's co- relation co-efficient r 0.90 and experts validated tool	Numerical pain intensity scale	During dialysis, after 2 hrs, stretching exercises was given for 15 min at interval of 30 min. Routine Rx was given to control group.	Calculated t value 7.05 > table value. H1 accepted.	Good
6	Dec-18	TNNMC Journal of Community Health Nursing	Beula	NA	60 / Quesi Exp. Pre test postest control group design/ purposive sampling	MMM dialysis unit, Chennai	NA	Numerical pain scale	NA	Statisctical significant diff in pre and post after implementation Stretching exercises	Medium
7	Dec-17	International Journal of Nursing Education	Manoj Panchiri	30 years and above	60 / one group pretest post test design/ purposive sampling technique	tertiary care center in Pune city	NA	Modified Penn's Spasm Frequency Scale numerical pain scale	NA	Stretching exercises were effective in reducing muscle cramps.	Medium
8	Apr-17	Journal of Nursing and Health Science	Samah Saad Salem	20 to 60 years	60 / Quesi Exp. One group Pre test post test design/ convenience sampling	Kasr El-Einy Center for Urology, Nephrology and Renal Transplantation	Cronbach alpha	Cramp assessment scale	Adopted from research exercise therapy center, faculty of physical education. Charles University.It includes nine different stretching exercises	t = 8.27 at p value = 0.000 & t = 5.22 at p value = 0.000 Intra-dialytic stretching exercise is an effective intervention to reduce leg muscle cramp among hemodialysis	Medium
9	Apr-17	Journal of Nursing a nd Health Science	Ms.Lekha.J	35 to 74 years	60 / Quesi Exp. Pre test postest control group design/ purposive sampling	dialysis unit-PSG, hospitals, Coimbatore	Interrater observational method Karl Pearson correlation 'r' 0.93 Experts validated the tool	Cramps Questionnaire chart visual analogue scale	Time-15 min, administered intradialytic stretching exercises during the 3rd and 4th hour of haemodialysis. 2 times per session. Comparison group was given 25% dextrose.	High statistical significant improvements were noted in the pre and post interventions on muscle cramps.	Good
10	2017	International Journal of Advance Research and Innovative Ideas in Education	Seham AL.Rashedi	20 to 60 years	30 / pretest postest control group design/ Random sampling	hemodialysis unit in KFHU, KSA	Experts validated the tool, reliability by test and retest method	medical history, blood tests, vital signs	Period-6 wks for 25 min during session. 3 times per wk. 5 min warm up, 5 min cycling on ergometer, 5 min rest, again 5 min cycling, 5 min stretching. And for control group routine Rx	leg exercise during hemodialysis shows statistical significant improvement in the blood urea nitrogen during the follow up period of studied group	Good

11	Jun-16	International Journal of Information Research and Review	Dr. Danasu, R.,	NA	70 / pre experimental Design/ Purposive Sampling Technique	Sri Manakula Vinayagar Medical College & Hospital, Puducherry	NA	modified Pens Spasm Frequency Scale	NA	In pre-test 27 (38.5%) moderate level, 43 (61.4%) severe level. In post-test 05 (07.1) no cramps, 28 (39.9%) mild , 37 (52.8%) moderate level, no one severe	Medium
12	Jun-16	International Journal of Multidisciplinary Research and Development	Kingsle Kishore Coumar M.F	31 to 60 years	40 / one group pretest post test design/ convenient sampling	east coast hospitals at Puducherry	NA	Interview Schedule, Modified Muscle Cramps Scale Tool	NA	in pre-test 19(47.5%) having severe, 18(45%) moderate, 3(7.5%) mild muscle cramp respectively whereas in post test 3(7.5%) having severe, 11(27.5%) moderate, 17(42.5%) mild and 9(22.5%) having no level of muscle cramp.	Medium
13	Apr-16	thesis	Punithavathi R	21 to 70 years	60 / True experimental design post test only control group design/ simple random sampling	dialysis unit governm ent hospital kallakuri chi	Experts validated the tool, reliability NA	Muscle cramp assessment tool	Flexion & Extension stretching exercises was given to both legs. Exercises were given at the end of 1st hr of dialysis and muscle cramps were assessed at 2, 3 and 4th hour of same day.	post test mean score of muscle cramps in experimental group was 33.40 with SD 6.48. whereas in the control group it was 44.20 with SD 5.99 calculated t value 6.698 found	Good
14	2016	Asian Journal of Phytomedicine and Clinical Research	Shyla Isaac	NA	60 / pretest postest control group design / purposive sampling technique	selected hospitals at Coimbatore, Tamil Nadu	NA	Modified Brief Pain Inventory Scale	Dorsiflexion and extension and flexion exercises were given to ankle and knee joints for 60 times. Procedure was repeated on alternative days for 5 days.	Intradialytic stretching exercise was effective to relieve the muscle cramps among patients undergoing hemodialysis	Medium
15	2015	Thesis	PRIYAKRISHN A	20 years and above	60 / true experimental design / systematic random sampling	Apollo hospitals, Chennai	inter rater technique, Karl Pearson, 'r' value 0.9 and experts	Modified Brief Pain Inventory Scale	Passive exercises from end of 2nd hr of dialysis till completion of dialysis. Flexion & extension of knee & hip joints for 5 times repeated every 15 min	experimental group with t' value of 4.86 at P< 0.001 level. Hence the null hypothesis rejected	Good

Results and Discussion

General Characteristics: The first objective of the study was to understand the research methodology used in the various studies. The research methodology used by various investigators in this systematic review is presented in table-1. There were 4 each study published in 2017, 2018 and 2016 and 1 each in 2015, 2019 and 2020. Out of 15 studies included in the review 5 studies are from a published thesis available on the databases. Maximum studies were published and conducted in India. Sample sizes in the studies were between 30 & 70. Sample size of 60 was very common among most of the studies. The age group in all the studies ranged between 18 to 74 years. And in only one study it was 20 years and above. Only four studies used true experimental design and remaining studies used quasi experimental design.

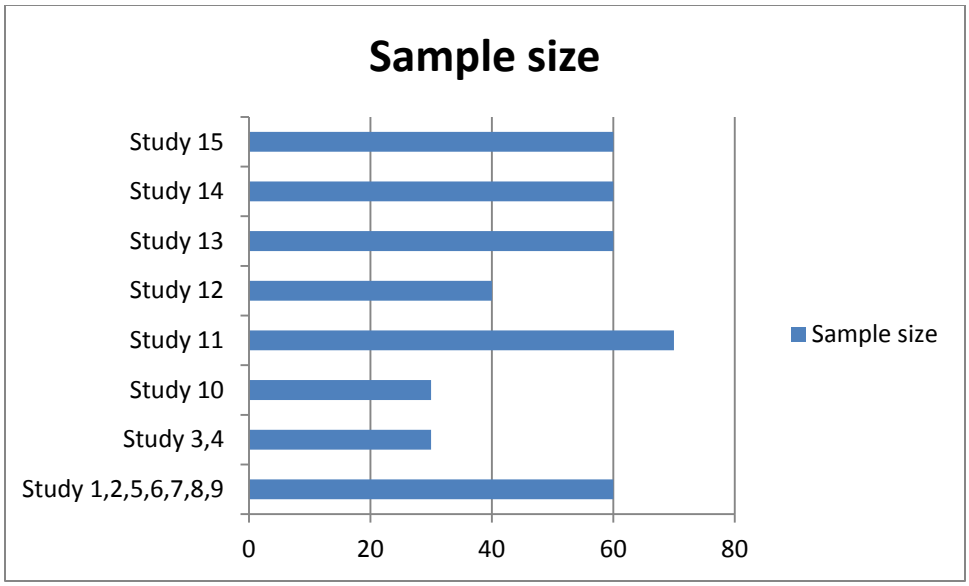

Figure-2 Sample size distribution in hemodialysis patients from 2015 to 2020

Muscle Cramps Assessment: The second objective of the study was to find out how the muscle cramps were assessed among hemodialysis patients. Out of 15 studies included 4 studies used cramps questionnaire chart & pain scale, 4 studies used only pain scale, 2 studies used Penn's spasm frequency scale, 3 studies used cramps assessment scale to assess the muscle cramps among hemodialysis patients. Two studies did not explain how they assessed the muscle cramps among hemodialysis patients.

Data Analysis Methods: The third objective of the study was to understand the data analysis methods used in the studies. Only one study used Anderson Darling test to test the homogeneity of the samples. Most of the studies used frequency, percentage, mean and standard deviation for continuous variables, chi square test for categorical variables and t-test for comparison. One study used Fisher's test for categorical variables. Three studies mentioned that they used SPSS software for data analysis.

Intradialytic exercises: The fourth objective of the study was to understand the procedure of intradialytic exercises and its effect. The time for the intervention ranged between 10 to 30 minutes. The exercises were usually given at the end of 1st hour or 2nd hour during the hemodialysis. Usually stretching exercises comprised of ankle dorsiflexion, gastrocnemius stretching, soleus stretching, hamstring stretching and quadriceps stretching. Single study used cycle ergometer to reduce the muscle cramps. The comparison or control group was either given 25% dextrose or routine treatment. One of the study used stretching exercises, range of motion and isometric exercises. Here the researcher thought the exercises with posters, handouts, demonstrations and also took re-demonstration from the participants. All the studies concluded that intradialytic stretching exercises are effective in reducing the muscle cramps. None of the studies discussed regarding the safety or complications of the exercises.

Conclusion

The present review of the literature reveals that in most of the studies the sample size was very small to draw the generalizations of the study and also the sampling technique used was non probability in majority of the studies. Though it is seen that intradialytic stretching exercises are effective in reducing the muscle cramps among hemodialysis patients but still there is a very less literature available with good quality to generalize the findings. Hence studies with larger sample size and probability sampling technique can be conducted to understand the effect of the interventions and also the safety and complications of the stretching exercises has to be recorded.

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