Intradialytic Stretching Exercises on Muscle Cramps: A Systematic Review

Basavant Dhudum¹, Dr.Nilima R Bhore²
¹ Assistant Professor, (Ph.D. Scholar), College of Nursing, Sangli, BharatiVidhyapeeth(Deemed to be University), Pune, India.
² Dean Faculty of Nursing & Principal, College of Nursing, Sangli, BharatiVidhyapeeth(Deemed to be University), Pune, India.

Received: 14 April 2020 Revised and Accepted: 8 August 2020

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 prognosis¹. 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 transplantation². The frequently experiencing symptoms by patients receiving hemodialysis are fatigue, muscle cramps, body aches and headaches³.
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. 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.

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. 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)*

![Systematic Review Flow Diagram](image-url)

Records identified through database searching
(n = 45)

Additional records identified through other sources
(n = 120)

Records after duplicates removed
(n = 130)

Records screened
(n = 52)

Records excluded
(n = 78)

Full-text articles assessed for eligibility
(n = 33)

Full-text articles excluded, with reasons
(n = 19)

Studies included in quantitative synthesis (meta-analysis)
(n = 15)

**Figure-1- Systematic Review Flow Diagram.**
<table>
<thead>
<tr>
<th>S.No</th>
<th>Publish. year</th>
<th>Journal Name</th>
<th>First author</th>
<th>Age range</th>
<th>Sample size/ Research Design/ Sampling technique</th>
<th>Setting</th>
<th>Reliability &amp; validity</th>
<th>Data collection tool</th>
<th>Intervention</th>
<th>Result</th>
<th>Quality of article</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mar-2020</td>
<td>Assiut Scientific Nursing Journal</td>
<td>Aamna Hassan Alhady</td>
<td>18-65 years</td>
<td>60 / pre test post test design</td>
<td>dialysis unit at Sohag University Hospital</td>
<td>Validity-5 experts reliability- cronbach’s alpha coefficient r=0.72</td>
<td>(I): Structured Interview Questionnaire sheet (II) : Cramp questionnaire chart and visual analogue scale: Pre/ post test (III) : Fatigue severity scale (IV) : Intradialytic exercise</td>
<td>Time-20 minute, consisted of 3 parts. Stretching exercises, Range of motion exercises and isometric exercises. Teaching methods discussion, posters, handout, demonstration and redemonstration was used.</td>
<td>Statistical significant diff in pre and post after implementation Stretching exercises</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>2019</td>
<td>International Journal of Advances in Nursing Management</td>
<td>Kaur Lakhwinder</td>
<td>NA</td>
<td>60 / Quasi Exp purposive sampling technique</td>
<td>still hospital and Inda Kidney Hospital, Jalandhar, Punjab</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>There was significant difference between mean posttest grade of muscle cramps in control and experimental group local = 4.746 at p=0.05.</td>
<td>Medium</td>
</tr>
<tr>
<td>3</td>
<td>Oct-18</td>
<td>Thesis</td>
<td>Mr. Ravi R</td>
<td>20 to 60 years</td>
<td>60 / true exp. Design/Simple random sampling technique lottery method</td>
<td>dialysis unit, Jyayacal Hospital, Kanyakumari</td>
<td>Sperman brown’s formula for reliability r 0.89 Experts Validated tool</td>
<td>Cramps Questionnaire chart Numerical pain intensity scale</td>
<td>Time-10-15 min, end of 1st hour stretching exercises was given of exp. Group and routine Rx was given to control group. For remaining 3 hours, characteristics of muscle cramps was assessed hourly.</td>
<td>The diff in cramps score was 5.4% in exp. Group and 1.9% in control group between day 1 and day 3</td>
<td>Good</td>
</tr>
<tr>
<td>4</td>
<td>Oct-18</td>
<td>Thesis</td>
<td>A. Vinola</td>
<td>40 to 70 years</td>
<td>60 / Semi Exp One group Pre test post test design/ purposive sampling technique</td>
<td>dialysis unit of Sundaram Hospital Trichy</td>
<td>KarlPearson’s correlation coefficient r 0.03</td>
<td>Cramps Questionnaire chart Numerical pain intensity scale</td>
<td>Time- 20 min for 5 consecutive days. Post test was done everyday after intervention.</td>
<td>calculated t value was 10.07. Mean pre test score was 11.1 and post test was 8.76.</td>
<td>Medium</td>
</tr>
<tr>
<td>5</td>
<td>Oct-18</td>
<td>Thesis</td>
<td>Yom Mathew</td>
<td>55 to 74 years</td>
<td>60 / Quasi Exp Pre test post test design/ purposive sampling technique</td>
<td>MIMS THANAL dialysis centre, Vadakara Kerala</td>
<td>KarlPearson’s correlation coefficient r 0.03 and experts validated tool</td>
<td>Numerical pain intensity scale</td>
<td>During dialysis, after 2 hrs, stretching exercises was given for 15 min at interval of 30 min. Routine Rx was given to control group.</td>
<td>calculated t value was 7.05 &gt; table value. p&lt;0.01 accepted.</td>
<td>Good</td>
</tr>
<tr>
<td>6</td>
<td>Dec-18</td>
<td>TNMNC Journal of Community Health Nursing</td>
<td>Beula</td>
<td>NA</td>
<td>60 / Quasi Exp Pre test post test design/ purposive sampling technique</td>
<td>MMM dialysis units, Chennai</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Statistical significant diff in pre and post after implementation Stretching exercises</td>
<td>Medium</td>
</tr>
<tr>
<td>7</td>
<td>Dec-17</td>
<td>International Journal of Nursing Education</td>
<td>Manoj Panchari</td>
<td>50 years and above</td>
<td>60 / Quasi Exp Pre test post test design/ purposive sampling technique</td>
<td>tertiary care center in Pune city</td>
<td>NA</td>
<td>Modified Penn’s Spains Frequency Scale numerical pain scale</td>
<td>NA</td>
<td>Stretching exercises were effective in reducing muscle cramps.</td>
<td>Medium</td>
</tr>
<tr>
<td>8</td>
<td>Apr-17</td>
<td>Journal of Nursing and Health Science</td>
<td>Sukhjinder Sidhu</td>
<td>20 to 60 years</td>
<td>60 / Semi Exp One group Pre test post test design/ convenience sampling</td>
<td>Kair EI-Emy Center for Urology, nephrology and Renal Transplantation</td>
<td>Cronbach alpha</td>
<td>Cramp assessment scale</td>
<td>Adapted from research exercise therapy center, faculty of physical education, Charles University. It includes nine different stretching exercises</td>
<td>r&lt; 8.21 at p value = 0.000 R&lt; 5.22 at p value = 0.000 Intra-dialytic stretching exercise is an effective intervention to reduce leg muscle cramp among hemodialysis</td>
<td>Medium</td>
</tr>
<tr>
<td>9</td>
<td>Apr-17</td>
<td>Journal of Nursing and Health Science</td>
<td>Ms.Lakha J</td>
<td>35 to 74 years</td>
<td>60 / Quasi Exp Pre test post test design/ purposive sampling</td>
<td>dialysis unit, PSG, hospitals, Coimbatore</td>
<td>Interobserver reproductability method Karl Pearson correlation r= 0.93 Experts validated the tool</td>
<td>Cramps Questionnaire chart visual analogue scale</td>
<td>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.</td>
<td>High statistical significant improvements were noted in the pre and post interventions on muscle cramps.</td>
<td>Good</td>
</tr>
<tr>
<td>10</td>
<td>2017</td>
<td>International Journal of Advance Research and Innovative Ideas in Education</td>
<td>Seham AL.Rashedi</td>
<td>20 to 60 years</td>
<td>50 / posttest posttest control group design/ Random sampling</td>
<td>Hemodialysis unit in KFHU, KSA</td>
<td>Experts validated the tool, reliability by test and retest method</td>
<td>medical history, blood tests, vital signs</td>
<td>Period-6 wks for 25 min during session. 3 times per wk. 5 min warm up, 5 min cycling on stepper, 5 min rest, again 5 min cycling. 5 min stretching. And for control group routine Rx</td>
<td>Lig exercise during redemonstration shows statistical significant improvement in the blood area nitrogen during the follow up period of studied group</td>
<td>Good</td>
</tr>
</tbody>
</table>
### 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.
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.

References


10. Vimala A. Effectiveness of Intradialytic Stretching Exercises on Reduction of Muscle Cramps among patients undergoing Haemodialysis at Sundaram Hospital, Trichy (Doctoral dissertation, Indira College of Nursing, Tiruchirappalli).

11. Mathew T. A study to assess the effectiveness of intradialytic muscle stretching exercises on the level of pain during muscle cramps among patients undergoing hemodialysis in a selected hospital at Kerala (Doctoral dissertation, Annai Meenakshi College of Nursing, Coimbatore).


15. Lekha J. Effectiveness of intradialytic stretching exercises on prevention and reduction of muscle cramps among patients undergoing Haemodialysis at PSG Hospitals, Coimbatore (Doctoral dissertation, PSG College of Nursing, Coimbatore).


