

Effect of Intradialytic Stretching Exercises on Muscle Cramps among Elderly Patients Undergoing Hemodialysis

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Abstract: Background: Muscle cramps occur frequently among elderly hemodialysis patients, which can be avoided by the application of intradialytic stretching exercises. **Purpose:** Determine the effect of intradialytic stretching exercises on muscle cramps among elderly patients undergoing hemodialysis. **Setting:** The study was conducted at hemodialysis unit in Meet Khaqan Health Center affiliated to Shebin El-Koum Fever Hospital. **Sample:** The study subjects comprised of a convenience sample of 50 elderly patients who were registered in dialysis unit's files. **Instruments:** First, Structured interviewing questionnaire. Second, cramp questionnaire chart and visual analogue scale. **Results:** There was a highly statistically significant difference in the level of muscle cramps pre and post implementation of intradialytic stretching exercises ($p < 0.001^{**}$). **Conclusion:** There was a significant reduction in the muscle cramps level after application of the intradialytic stretching exercises. Thus, these exercises are an effective and simple measure to prevent or reduce severity of muscle cramps among elderly hemodialysis patients. **Recommendations:** Intradialytic stretching exercises should be combined with routine nursing care for hemodialysis patients.

Keywords: *Intradialytic stretching exercises, Muscle cramps, Elderly patients, hemodialysis.*

Introduction

Older people are those who aged 60 or 65 years old or more (WHO, 2022). The number of older persons is growing faster worldwide and now people are living longer because of improvements in diet, sanitation, medicine, health care, education, and economic advances (WHO, 2020; Gu et al., 2021). Aging is a complex biological process characterized by accumulation of changes and loss of physiological integrity over time. These changes are often a driving factor of various diseases, including age related diseases. One of these changes is the functional and structural

kidney changes that are associated with ageing (Chung, 2021; Li et al., 2021). CKD is frequently diagnosed between the elder population (Chou & Chen, 2021). It is usually asymptomatic until the development of End Stage Renal Disease (ESRD) (Gerogianni & Babatsikou, 2019). This happens when the GFR drops below 15 mL/min per 1.73 m², which means the kidney can no longer sustain life and the patients will require renal replacement therapies (RRT) (Shraida et al., 2021; Vaidya & Aeddula, 2022). Hemodialysis (HD) is the most common RRT used for ESRD treatment (Gerogianni & Babatsikou,

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2019). It is a process of purifying the blood from wastes through a semi-permeable membrane acts as artificial kidney (Gite, 2020). The number of patients receiving HD has increased globally, with the elderly population demonstrating the most rapid growth rate (Chou et al., 2022). HD treatment is accompanied by many complications such as fatigue, muscle cramps, hypotension, disequilibrium syndrome, nausea, body aches and headache, (Gite, 2020; Paul & Das, 2022).

Muscle cramps is one of the common intradialytic complication reported by HD patients (Lekha, 2016; Shraida et al., 2021). According to many studies, muscle cramps occur in 33% up to 86% among HD patients. (Takahashi, 2021). The triggers of this cramping including hypotension, electrolyte depletion, carnitine depletion, changes in plasma osmolality hyponatremia, hypomagnesaemia, and tissue hypoxia (Bagchi, 2020; Anbu & Rathiga, 2021). Muscle cramps may be extremely severe that cause the patients to discontinue their HD sessions earlier (Dhudum & Bhore, 2020). This problem is worsen as dialysis patients aged (Chan et al., 2019).

Several studies have revealed the importance of exercises as a way to manage cramps (Jancy & Parimala, 2020). Intradialytic stretching exercise is one of the most interventions used to treat muscle cramping (Dhudum & Bhore, 2020). As it helps to increase the patient's muscular endurance and strength (Salhab et al., 2019). Patients receiving HD need specially trained staff and special nursing care (Saleh et al., 2018), so it is considered a vital role of the nurses who providing care to these patients to take the appropriate action to stop muscle cramp from occurring Poornazari et al., 2019; Anbu & Rathiga, 2021).

Purpose of the study:

To determine the effect of intradialytic stretching exercises on muscle cramps among elderly patients undergoing hemodialysis.

Research hypothesis:

There will be a significant reduction in the level of muscle cramps after application of intradialytic stretching exercises among elderly hemodialysis patients.

Methods

Research Design:

A quasi-experimental research design (one group pretest/ posttest design) was utilized.

Setting:

The study was conducted at hemodialysis unit in Meet Khaqan Health Center affiliated to Shebin El-Koum Fever Hospital, which located in Meet Khaqan village at Shebin Elkom city, Menoufia Governorate, Egypt.

Sample:

A convenience sample of 50 elderly patients who were registered in dialysis unit's files.

Inclusion criteria:

- Age 60 years or older
- Both genders (male & female)
- Receiving regular hemodialysis
- Patients who are conscious and cooperative.
- Patients who suffered from muscle cramps during hemodialysis.

Exclusion criteria:

- Have any lower limb pathology
- Patients undergoing emergency and first hemodialysis.

Data Collection Instruments:

Instrument I: Structured interviewing questionnaire It

consisted of two parts: -

Part 1: Sociodemographic data of the elderly patients: including name, telephone number, age, sex, marital status, level of education, working condition and residence.

Part 2: Medical history of the patients: including presence of associated diseases, years of hemodialysis treatment, number of sessions a week, duration of the session (hours), cramp days, time of intradialytic muscle cramp, site of the cramp, muscle included in the cramp.

Instrument II: Cramp questionnaire chart and visual analogue scale. This instrument was developed by Morris (2014). It was used to assess patients' level of muscle cramps before and after exercises application.

Scoring system

The total score of the instrument ranged from 0-13. Which were categorized as follows: a 0-score indicating no cramps, 1-4 score indicating mild cramps, 5-8 score indicating moderate cramps, and 9-13 score indicating severe cramps.

Validity and Reliability

The data collection instruments were tested for face and content validity by a jury of five experts for accuracy, clarity and completeness and their recommended modifications were taken into consideration.

The reliability of the instrument II was established by using Karl Pearson's correlation co-efficient, by test-retest method, the reality was $r = 0.93$.

Pilot study

A pilot study was carried out on 10% of the total sample (5 patients) to test the feasibility, clarity, and applicability of the instruments. No modifications

were done, so the pilot study sample wasn't excluded from the study.

Ethical Considerations

An approval sheet was obtained from the Ethical Research Committee of the Faculty of Nursing, Menoufia University.

An official letter was obtained from the dean of the faculty of nursing and directed to the administrator of the setting to permit data collection and gain their support.

Verbal informed consent was taken from each participant after they were being informed about purpose, procedure, benefits and nature of the study.

Data collection procedure

The data was collected from the beginning of April, 2022 to the end of August, 2022.

- Instruments of data collection and an educational booklet were developed after reviewing the relevant literature. Also, the instruments were tested for validity and reliability.
- Verbal informed consent had been obtained from each participant matched with the inclusion criteria, and they were assured of close confidentiality of data.
- Each participant was interviewed individually to collect essential data by using study instruments (pretest). It took about 25-30 minutes.
- The researcher provided her intervention. Firstly, by explaining the causes of muscle cramps as well as the purpose, benefits, and steps of passive and active stretching exercises using educational booklet.
- The researcher started with passive exercises followed by active exercises performed by the patient. Stretching exercises consisted of soleus stretching, ankle dorsiflexion, gastrocnemius

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stretching, hamstring stretching, and quadriceps stretching.

- The exercise program was provided on individual basis by demonstration and re-demonstration.
- Each participant received the exercise procedure for about 20 minutes.
- Following the implementation of the exercise program, each patient was given a printed copy of the booklet
- The researcher visited the hemodialysis units for 3 to 4 days a week and implemented the exercise program for 2 to 4 patients daily.
- The posttest was taken from each participant one month after starting to practice the intradialytic stretching exercises.

Statistical analysis

Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 22. The graphs were done using the Excel program. For qualitative data the number and percentage were calculated and represented in the form of frequency distribution tables. While, the quantitative data were represented by range, mean (\bar{x}) and standard deviation (SD). Level of significance was judged at P value <0.05 for the test used.

Results

Table (1) represents the socio-demographic characteristics of the studied patients. As shown, the mean age of the studied patients was 65.06 ± 4.96 and 60% of them were males. Majority of the studied patients (80%) were married and two-fifths of them (40%) had a secondary education. Also, the majority of them (80%) were not work and more than half of them (60%) were rural residents.

Table (2) clarifies the medical data of the studied patients. Majority of the studied patients (88%) had associated diseases, with 84% of them suffered from hypertension. More than two-fifths (42%) of them underwent HD for more than 4 years and most of them (94%) had a 3 times dialysis session per week for 4 hours (96%) each session.

Table (3) illustrates the distribution of the studied patients regarding their cramp variables. As represented, 46% of patients experienced muscle cramps twice a week, 70% of them experienced cramps on dialysis days, and most of the studied patients (92%) experienced muscle cramps during the last hour of their HD session. Regarding the site of muscle cramps, 84% of the patients experienced cramps in both legs and 98% of them reported cramps in the calf muscle. All of the patients (100%) received medication (saline solution) and had fluid removal stopped temporarily or infused back as a first option of treatment.

Table (4) shows that, there was a statistically significance difference in the level of muscle cramps throughout the two periods of measurements. As represented, in the pre-test, 70% of the patients had severe cramps and 30% of them had moderate cramps. While in the post-test, more than half of them (56%) had no cramps, 38% had mild cramps and only 6% of the patients experienced moderate muscle cramps.

Fig.2 shows a significant difference in additional times of muscle cramp occurrence before and after intervention. As shown, after session, during sleep and at any time throughout the day were the most common additional times of cramp occurrence with a percentage of 75.7%, 64.9% and 10.8% respectively. These percentages reduced to 4%, 6% and 0% respectively in the posttest.

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Table (1): Distribution of socio-demographic characteristics of the studied patients (n=50)

Socio-demographic Characteristics	No.	%
Age (years)		
Min. – Max.	60.0 – 78.0	
Mean ± SD.	65.06 ± 4.96	
Gender		
Male	30	60.0
Female	20	40.0
Marital status		
Single	1	2.0
Married	40	80.0
Divorced	2	4.0
Widow	7	14.0
Education		
Illiterate	7	14.0
Primary education	10	20.0
Secondary education	20	40.0
High education	13	26.0
Working condition		
Still work	10	20.0
Not work	40	80.0
Residence		
Rural	30	60.0
Urban	20	40.0

Table (2): Distribution of the studied patients according to their medical data (n= 50).

Medical data	No.	%
Associated diseases		
No	6	12.0
Yes	44	88.0
Hypertension	42	84.0
Diabetes Mellitus	12	24.0
Cardiovascular diseases	1	2.0
Polycystic kidney	4	8.0
Other diseases	5	10.0
Duration of Hemodialysis treatment (years)		
<1 year	3	6.0
1-2 years	13	26.0
>2- 4 years	13	26.0
> 4 years	21	42.0
Number of hemodialysis sessions (week)		
Two	3	6.0
Three	47	94.0
Duration of session (hours)		
3 hours	2	4.0
4 hours	48	96.0

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Table (3): Distribution of cramp variables among the studied patients (n= 50).

Cramp variables	No.	%
Days of frequent muscle cramps occurrence		
Dialysis days	35	70.0
Non-dialysis days	0	0.0
Both days	15	30.0
Time of intradialytic muscle cramps		
First hour	0	0.0
Middle hours	4	8.0
Last hour	46	92.0
Site of muscle cramps		
Right leg	6	12.0
Left leg	2	4.0
Any of two legs	42	84.0
Muscle involved in cramp		
Calf	49	98.0
Thigh	4	8.0
Toes	18	36.0

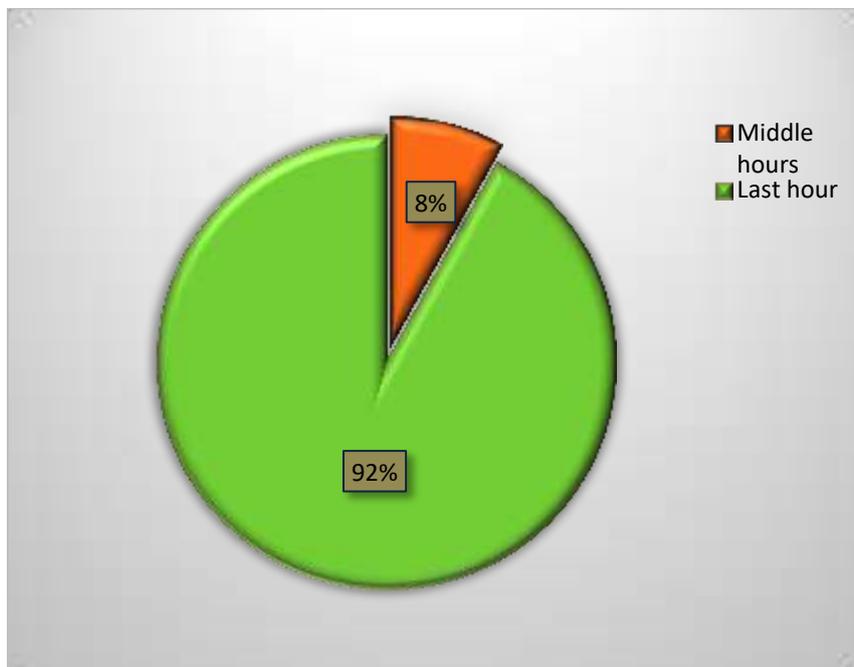


Figure (1): Percentage distribution of the studied patients according to time of intradialytic muscle cramps (n=50).

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Table (4): Differences in muscle cramp categories pre and post implementation of intradialytic stretching exercises among the studied patients (n=50).

Scoring System	Pre-intervention		Post-intervention (1 month)		P.value
	No.	%	No.	%	
No cramps (0)	0	0.0	28	56.0	P < 0.001**
Mild cramps (1-4)	0	0.0	19	38.0	
Moderate cramps (5-8)	15	30.0	3	6.0	
Severe cramps (9-13)	35	70.0	0	0.0	
Total score (Mean ± SD.)	9.40 ± 1.47		1.88 ± 2.20		

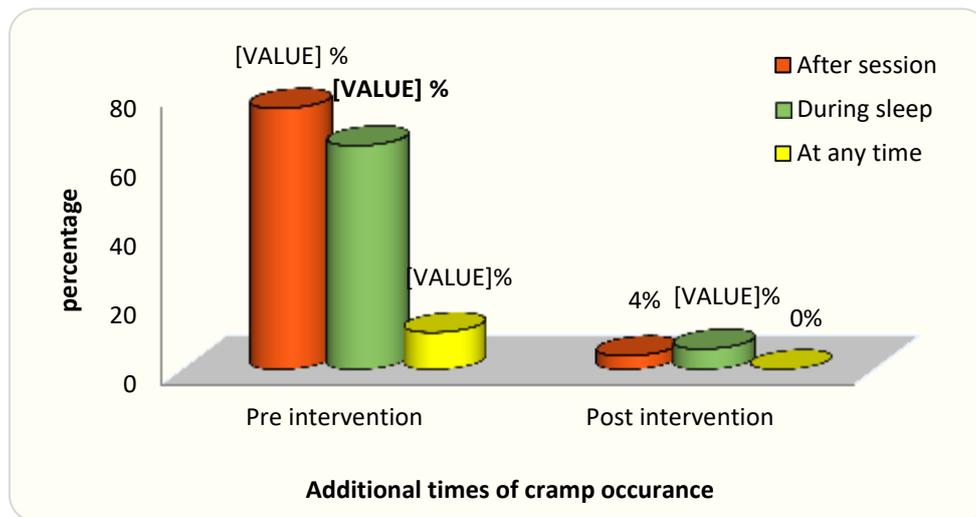


Figure (2): Percentage distribution of additional times of muscle cramp occurrence among the studied patients during pre and post intervention (n= 50).

Discussion:

Prevalence of ESRD is increasing with age (El-Ballat et al., 2019). Hemodialysis is one of the most widely used treatments for ESRD Patients (Lee & Son, 2021; Shraida et al., 2021). One of the most prevalent complications among dialysis patients is muscle cramps which frequently lead to the early termination of the HD session (Anbu & Rathiga, 2021). This can be avoided by application of exercises (Jayasrikanan et al., 2021). Therefore, this study was conducted to determine the effect of intradialytic stretching exercises on muscle cramps among elderly hemodialysis patients. The findings of the current study revealed that, majority of the studied

patients suffered from hypertension. This finding came in agreement with Ghaleb & Sharaf, (2020) they reported that hypertension was the most common disease among the studied patients. Also, El-Ballat et al., (2019) in their study reported that hypertension was the main cause of ESRD. On the contrary, Abouelala et al., (2021) found that more than two-fifths of the patients had diabetes mellitus. Regarding duration of hemodialysis treatment, the current study revealed that more than two-fifths of the elderly patients underwent HD treatment for more than four years. This finding agreed with Lekha, (2016) who

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reported that around three quarters of the studied patients underwent HD treatment for more than four years. While, this study finding was inconsistent with Elsayed et al., (2019) who found that more than two-fifths of patients were on HD treatment for less than five years.

In relation to duration of the session, the present study revealed that most of the patients receiving HD session for four hours. This result was similar to Algendy & Bahgat, (2019) they mentioned that most of participants receiving HD session for four hours. This result was incongruent with a study carried out by Abouelala et al., (2021) they mentioned that more than half of the patients receiving HD session for three hours.

Regarding days of muscle cramps, the present study findings illustrated that about three quarters of patients experienced cramps on dialysis days. This finding was supported by Punj et al., (2020) who reported that more than half of patients experienced muscle cramps on dialysis days only.

Regarding time of intradialytic muscle cramps, the present study clarified that most of the studied patients reported muscle cramps during the last hour of HD session. This result was consistent with with Lekha, (2016) who mentioned that most of participants experienced muscle cramps during the last hour of the HD session. Moreover, similar results reported by Chavda & Singh, (2018) they stated that most of the subjects experienced muscle cramps during the last hour of the session.

Relating to site of muscle cramps, the current study represented that most of the studied patients experienced muscle cramps at any of two legs and in the calf muscle. This present study results were in accordance with a study carried out by Jancy & Parimala, (2020) who found that majority of

patients' cramps occurred in both legs and over the calf muscles. On the other hand, the present study result was in contrast with Anbu & Rathiga, (2021) They indicated that half of patients reported muscle cramps in the right leg.

Regarding overall level of muscle cramps, the present study indicated that there was a significant difference between pre and post level of muscle cramps among the studied patients. More than two-thirds of patients had severe muscle cramps pre-exercises, while in post-test more than half of them had no cramps. This study result was consistent with Paul & Das, (2022) who reported that intradialytic stretching exercises were an effective method in reducing patients' level of muscle cramps. Also, the current study finding was similar to that of Shraida et al., (2021), who concluded that the study participants had moderate to severe muscle cramps during the HD procedure, but after application of exercise, a significant reduction in the severity of muscle cramps had been reported. This result signifies the effectiveness of intradialytic stretching exercises.

In relation to additional times of muscle cramps occurrence, the recent study findings indicated that muscle cramps also occurred after HD session in more than three quarters of the studied patients. Similar results were reported by Jancy & Parimala, (2020) in their study, they stated that majority of subjects also experienced muscle cramps after HD session. This might be due to a delayed response from the body to fluid volume changes and sedentary position for a long time.

Conclusion

Muscle cramps occur frequently among elderly hemodialysis patients.

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After practicing intradialytic stretching exercises, there was a significant reduction in the muscle cramps level. Thus, these exercises are an effective and simple measure to prevent or reduce severity of muscle cramps among elderly hemodialysis patients.

Recommendation

According to the study findings, it's recommended that; Intradialytic stretching exercises should be combined with routine nursing care for hemodialysis patients. A planned teaching program can be introduced to HD patients on various methods that help to reduce intensity of muscle cramps.

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