Effect of Intradialytic Stretching Exercises on Elderly Patients' Muscle Cramps and Stress

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Abstract

Background & Aim: Chronic kidney disease is a major health concern in Egypt, often requiring lifelong hemodialysis. Muscle cramps are among the most frequent complications during hemodialysis, affecting wellbeing and overall quality of life, especially in the elderly patients. Intradialytic stretching exercises provide a safe approach helping in reducing cramp severity reducing stress level, the current study **aimed to** evaluate the effect of intradialytic stretching exercises on elderly patients' muscle cramps and stress. **Methods & Materials:** A quasi-experimental design was used via a purposive sample of 100 elderly (50 cases & 50 control). Three tools were used; structured interview questionnaire (sociodemographic data & medical history), cramp questionnaire chart and DAS (21). **Results:** A significant reduction in the severity of muscle cramps from 52% as moderate and 46% as severe before intervention to 42% mild and 30% moderate after intervention at ($p<0.01$). Significant difference in stress, stress-free patients increased from 38% to 52% at ($p<0.01$). **Conclusion:** Intradialytic stretching exercises proved to be an effective tool in alleviating muscle cramps and reduce stress level among elderly hemodialysis patients. **Recommendations:** Tailor training for dialysis nurses emphasizing the crucial role of intradialytic stretching exercise in reducing muscle cramps, reducing stress level, and improving quality of live for elderly hemodialysis patients.

Keywords: Muscle cramps, Stress and Stretching exercises.

Introduction

Ageing population is a global phenomenon; virtually every country in the world is increasing in size and proportion of older people in its population. On the same line, in Egypt, Egypt's elderly population had reached approximately 6.9 million, 3.7 million males and 3.2 million females. **(Central Agency for Public Mobilization & Statistics 2024)**. Currently, Chronic kidney disease is one of the major health challenges in Egypt; it affects 13% of the adult population, resulting in a diminished quality of life and significant morbidity, mortality, and healthcare costs. It remained the 16th leading cause of premature death **(Nagib et al., 2023).**

Chronic kidney failure (CRF) is defined as the presence of kidney damage or GFR less than 60 ml/min per 1.73 square meters, persisting for 3 months or more. It is a state of progressive loss of kidney function, ultimately resulting in the need for renal replacement therapy (dialysis or transplantation) **(Vaidya & Aeddula, 2024).** Chronic kidney disease is a silent killer due to the lack of physical symptoms at the initial stage, but a steady loss of GFR occurs over a period longer

than three months **(Wang et al., 2020).**Identified causes and risk factors for chronic kidney disease are hypertension, diabetes mellitus, cardiovascular diseases, chronic glomerulonephritis, smoking, autoimmune disease, family history of kidney disease, nephrotoxic drugs, poor education level, and infectious disease next to poor sanitation, poor clean and safe water supply **(Alkhaqani et al., 2022).** Hemodialysis (HD) is considered the main mode of treatment for CRF as well as, one of the most high-tech procedures and a life-saving treatment for those patients; more than half of HD patients experience fatigue, muscle cramps, stress and disturbed sleep. Patients claim that symptoms have a significant impact on their quality of life because they interfere with their capacity to maintain healthy social interactions, financial security, and general well-being **(ELmetwaly et al., 2023).**

Muscle cramps is an unexpected, involuntary and painful contraction of a single muscle or a muscle group, relieved by stretching the cramping muscle. Muscle cramps are arisen from spontaneous ectopic discharges of motor nerves or the terminal branches of motor axons **(Dijkstra et al., 2022)**. Muscle cramps usually occur in the lower extremities but can also manifest in the arm, hand, and abdominal muscles **(Ameh et al., 2023)**, 35-86% of patients have lower extremities muscles cramps (**Dhudum & Bhore, 2020).** The most affected leg muscles are the gastrocnemius (at the back of lower leg), the hamstrings (the muscles behind the thighs), the quadriceps (the muscles in front of the thighs) and soleus **(Shalaan et al., 2024).**

Stress is a process that strains the body to cope with environmental demands, leading to psychological and biological changes that may contribute to illness. Prolonged stress can negatively impact the immune, cardiovascular, neuroendocrine, and central nervous systems (**Swathi et al., 2023).** Stress occurs when the individual considers their relationship with the environment to be threatening or overwhelming in a way, which can affect well-being. The HD patient experiences periods of great psychological stress over the course of the disease, with adaptation becoming necessary **(García-Martínez, et al., 2021).**

Intradialytic exercise is described as exercise training (IDE) done during an HD session to improve the patient's strength and endurance, hence improving different physiological and psychological characteristics (**Salhab et al., 2019).** IDE has attracted attention since it may counteract side effects from the treatment and increase the overall effectiveness of dialysis (**Momb et al., 2020).** IDE can enhance peripheral perfusion, blood pressure, muscle blood circulation, and physical labor capacity while reducing fatigue, uremic nephropathy, myopathy, and cramping in the muscles. As skeletal muscles' oxygen demands increase during intradialytic activities, cardiac output can increase fourfold, improving perfusion and lowering cardiac stunning **(Hatef et al., 2021).** Also, relax body and mind, improve focus and concentration, and reduce the risk of injury, reduction of stress and tension **(Bhuvaneswari et al., 2022).**

Nurses play a pivotal role in the comprehensive care of CRF patients, recognizing the importance of education in improving patient outcomes, nursing educational programs have been developed to equip patients with the necessary knowledge and skills. Nurses monitor and assess laboratory values. Collaborate with other healthcare providers to develop and implement individualized treatment plans **(Amutha, 2021).**

Method

Study Design and Setting

A quasi-experimental study design was utilized to conduct the current study in hemodialysis unit at Zagazig University Hospitals and El-Ahrar Teaching Hospital at Zagazig City.

Sample

The sample of this study included 100 elderly patients from the previous mentioned setting who met the following criteria; Receiving regular hemodialysis for not less than 12 hemodialysis sessions, agree to participate in the study, suffered from muscle cramps during hemodialysis, conscious and cooperative.

Sample size calculation

Jayasrikannan etal. (2021) found that the percent of mild muscle cramp post intervention program in experimental group was 37% whereas mild muscle cramp was 13% in control group, at confidence level 95% two side with power of study 80%. Sample size calculated using Open Epi, was 50 patients in each group.

Tool of data collection

To gather the required data, three tools were used. Tool **I:** a structured interview questionnaire that was developed by the researchers based on the literature review. It is composed of two parts. Part 1: demographic characteristics age, sex, residence, marital status, educational level, previous occupation, current occupation, living condition, sufficiency of monthly income, Part 2: health profile of the studied elderly; duration of disease, comorbidity with renal failure, causes of renal failure, duration of hemodialysis numbers of sessions per week, duration of hemodialysis session, occurrence of muscle cramps, affected muscle, time of occurrence of muscle cramps, time of intradialytic muscle cramps, methods that improve muscle contractions and quality of life. **Tool II: Cramp questionnaire chart (Morries, 2014)**.

The cramp questionnaire chart developed to assess the level of muscle cramps during hemodialysis, before and after intervention. It contains five closed-ended questions ***(Questions 1 to 5)*** about frequency of muscle cramps, duration of muscle cramps, level of pain, temperature of site of the pain and discomfort.

Scoring system: Total score ranged from 0 to13 according to Morries, the frequency of muscle cramps (ranging score from 0 to 2), duration of muscle cramps (ranging score from 0 to 2), level of pain (ranging score from 0 to 3), temperature (ranging score from 0 to 2) and discomfort (ranging score from 0 to 4). The total score of the instrument ranged from 0-13. It was categorized as follows: a 0-score indicating no cramps, 1-4 score mild cramps, 5-8 score indicating moderate cramps, and 9-13 score indicating severe cramps. **Tool III DASS (21)** adopted from **Souse et al, (2017)**: stress subscale only.

The stress subscale: It contains seven closed-ended questions *(Questions 1, 6, 8, 11, 12, 14&18)*. It assesses difficulty relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient.

Scoring system: The degree to which respondents endorsed the symptoms over the last week is rated on a scale that ranges from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). Higher scores reflect higher levels of symptom endorsement calculated by summing the scores for the relevant items. Scores on the DASS-21 will need to be multiplied by 2 to calculate the final score. The total score classified into five categories;

Normal	**0-14**
Mild	**15-18**
Moderate	**19-25**
Severe	**26-33**
Extremely Severe	**34+**

Educational Program

***Assessment phase*:**

This phase involved the pre-intervention data collection for baseline assessment. The researcher used to go to the hemodialysis units and wait for the elderly who met the criteria to be interviewed before starting their hemodialysis session. The researcher introduced herself and explained the purpose of the study briefly to the studied elderly and oral consent for participation was obtained. The researcher read and explained each item of the study scales to the elderly and then recorded their responses. The time consumed for answering the study tools ranged from 35 to 50 minutes. The data were collected through out assessment phase: The first phase (pre-test) of assessment was done prior to conducting the intervention using study tools. The second phase (post-test) of assessment was done immediately post intervention using the same tools.

Planning phase:

Based on the results obtained from the data analysis of the assessment phase, and in view of the pertinent literature about stretching exercise, the researcher developed the intervention and sessions content to meet the elderly needs and the study objectives. Identified needs, requirements and deficiencies were translated into aim and objectives of program and set in the form of an illustrated colored booklet that was prepared by the researcher and its content was validated by scientific committee and then distributed to each of the studied elderly as a guide for all of pertinent data related to intervention. This phase lasted for 6 weeks.

Implementation phase:

The intervention was implemented for the studied elderly. They acquired pertinent basic knowledge about renal failure, hemodialysis, muscle cramps, functional abilities, psychological wellbeing and stretching exercises. The intervention was offered to the studied elderly in the form of thirteen sessions to give more chance for discussions, interactions, and practical training. All patients received the same content using the same teaching methods, media, discussions and the

same booklet. The researcher allocated three days per week for implementation of the nursing intervention.

The length of each session was variable according to elderly's responses and active participation, as well as the time available, and the content of each session. To ensure that the studied elderly understood the content, each session was started by a summary about what was given through the previous session and the objectives of the new one, taking into consideration the use of simple language to suit the level of understanding of the elderly. Motivation and reinforcement techniques were provided and recognition during the session were used to exchange ideas and foster learning. The sessions were aided by pictures, brochure, videos as well as the booklet.

Evaluation phase:

The evaluation of the effectiveness of the educational program (posttest) was done just after completion the program. These were done using the same data collection tools of the pre-test.

Validity & reliability

The validity was done by group of panels who were three Experts from nursing and medical staff who reviewed the tools and ascertained clarity, relevance, comprehensiveness, and understandability. The reliability of the study tools was tested with Cronbach alpha coefficient through their internal consistency.

Ethical Considerations

The study protocol was approved by the research ethics committee of the Faculty of Nursing at Zagazig University. An informed consent for participation was taken verbally from each of the elderly subjects after being properly informed of its purpose. Participants were given the option to decline participation and informed that they might leave at any time during the data collecting interviews. They were also given the assurance that the information would be kept private and used exclusively for the research purpose.

Statistical analysis

The collected data were organized, tabulated, and statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 27. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means, standard deviations for quantitative variables. Chi-square was used to assess the relations between variables and their characteristics. Independent t-test was used to compare the means of the study variables between the study and control groups. The one-way analysis of variance (ANOVA) was used to determine whether there are any statistically significant differences between the means of three or more variables with continuous data and paired t-test was used to compare the means of the study variables pre and post the intervention in each group. In order to identify the correlation between the main study variables, Pearsons's correlation coefficient was used. In order to identify the independent predictors of the main study variables, the multiple linear regression analysis was used, and analysis of variance for the full regression models was done. Cronbach alpha coefficient was calculated to assess the reliability of the study tools through their internal consistency**.**

Results

Concerning sociodemographic characteristics, 62% of the studied patients in the study group aged 65 years and more and the mean age of them was 66.04±4.59 years, 54% of them were males, 70% of them belonged to rural areas, 48% of them were married, 54% of them were illiterate, 40% of them were housewives before retirement, while 50% of them work without effort now and 48% of them were living arrangements their husband /wife. Moreover, 52% of them had sufficient income. Meanwhile, 54% of the studied patients in the control group aged 65 years and more and the mean age of them was 65.90±5.05 years, 52% of them were males, 66% of them belonged to rural areas, 54% of them were married, 48% of them were illiterate, 38% of them were housewives before retirement, while 46% of them work without effort now and 54% of them were living with their husband /wife. Moreover, 56% of them had sufficient income. There were no significant differences in terms of demographic characteristics between the study and control groups.

Concerning medical history, 46% and 46% of the studied patients in both study and control groups had hypertension respectively. Concerning causes of renal failure, 42% of studied patients in the study group were mentioned patients in the study group as a main cause of renal failure compared to 42% of studied patients in the control group were mentioned diabetes as a main cause of renal failure. as regards to duration of hemodialysis treatment 48% of the studied patients in study group received hemodialysis treatment for five years and compared to 50% of studied patients in the control group were received hemodialysis treatment from one year to less than five years.

Almost all studied patients in the study and control group attended three hemodialysis sessions a week for four hours. As regards to painful muscle cramps, all of the studied patients in both study and control groups suffered from painful muscle cramps over the past three months, the highest percent ages of the studied patients in both study and control groups 88% and 82% had Gastrocnemius muscle cramps respectively and 42% and 48% of them described the location of pain the right leg respectively. Furthermore, 48% and 42% of studied patients in study and control groups suffered from muscle cramps during day respectively.

Regarding time of intradialytic muscle cramps, the highest percentage of studied patients in both groups suffered from muscle cramps the end of the hemodialysis session (76% and 80%) respectively. Also, 66% and 58% of the studied patients in the study and control groups their muscle cramps improved spontaneously respectively. Meanwhile, 54%and 54% of the studied patients in the study group and control groups their quality of life partially deteriorated due to muscle cramps.

Elderly patient's muscle cramps level pre and post intervention in the study and control groups (n=100)

Table 1 reveals, that there were marked decreased in all parameters of muscle cramps post-intervention only in the study group and this diminished was obvious especially in frequency of cramps, duration of the cramps, level of pain, temperature and discomfort and these results were

found highly statistically significant ($p<0.01$). Meanwhile, the control group had no statistically significant difference in all parameters of muscle cramps pre- and post-intervention.

Elderly patient's total muscle cramps level pre/ post -intervention (n=100)

Figure 1 sketches that, 52% and 46% of the elderly patients in the study group had moderate and sever muscle cramp pre intervention respectively, which the score of the muscle cramps was declined to be 42% and 30% mild and moderate respectively with significant difference ($p<0.01$).

Elderly patient's stress level pre and post intervention in the study and control groups(n=100)

Table 2 reveals that, there was marked decreased of mean scores of I tended to over-react to situations, I found it difficult to relax and I was intolerant of anything that kept me from getting on with what I was doing respectively in the study group post intervention and these reductions were highly statistically significant ($p<0.01$). Compared to the control group that had no statistically significant difference in all statements of stress scale pre- and post-intervention.

Elderly patient's total stress level pre/ post -intervention (n=100).

Figure 2 clarifies that, 38% of the elderly patients in the study group did not have stress pre intervention, while this score was improved to be 52% post intervention with significant difference ($p<0.01$). On the other hand, 26% of the elderly patients in the control group did not have stress pre intervention and decreased to be 16% post intervention with no statistically significant difference pre/post-intervention.

Relation between characteristics of the studied elderly patients in the study group and their total level of muscle cramps pre/ post -intervention

Table 3 displays highly statistically significant relations between studied elderly patient's level of muscle cramps and age, level of education and living arrangements post intervention ($p<0.01$). In addition, there were a statistically significant relations with sex, place of residence, marital status, occupation before retirement and sufficiency of monthly income pre/ post -intervention ($p<0.05$). As noticed from this table, elderly patients aged 60<65 years, males, those belonged to urban areas, were divorced, reads and writes level of education, craft occupation before retirement, living with one of sons, and in sufficient monthly income had the lowest level of muscle cramps mean score.

Relation between characteristics of the studied elderly patients in the study group and their total level of stress pre/ post -intervention

Table 4 represents highly statistically significant relation between studied elderly patient's total level of stress and their sex pre/ post -intervention ($p<0.01$). In addition, there were a statistically significant relations with Age (years), level of education, occupation before retirement, and sufficiency of monthly income pre/ post -intervention ($p<0.05$). As noticed from this table, elderly patients aged 60 <65 years, females, reads and writes education, craft before retirement, and had sufficient and saving monthly income had the lowest of level of total stress mean score.

Best fitting multiple linear regression model for total muscle cramps score

Table 5 demonstrates male sex as a statistically significant independent positive predictor of the muscle cramps ($p<0.05$). In addition, being divorced, craft occupation before retirement and living with one of sons were highly statistically significant independent positive predictors of the muscle cramps ($p< 0.01$).

Best fitting multiple linear regression model for total stress score

Table 6 indicates that, female sex and being house wife (before retirement) were statistically significant independent positive predictors of the stress score ($p<0.05$). In addition, work with effort (currently) and living with relative were statistically significant independent positive predictors of the stress score ($p< 0.01$).

Correlation between studied variable pre/ post of the studied elderly patients in the study group

Table 7 shows highly statistically significant positive correlation between the studied elderly patients' muscle cramps and anxiety pre-intervention ($p<0.01$). The same table also reveals highly statistically significant positive correlations between the studied elderly patients' muscle cramps and stress post-intervention ($p<0.01$).

Discussion

Regarding older patient's total muscle cramps level pre/ post -intervention, the present study results indicated no improvement among control group, albeit there was a significant difference between pre and post level of muscle cramps among the studied patients. Before the intervention, just over half of the patients in the study group experienced moderate muscle cramps, while nearly half (46%) reported severe cramps. However, after the intervention, these numbers significantly improved, with fewer than half reporting mild cramps and around one third reporting moderate cramps, indicating a notable reduction in muscle cramp severity ($p<0.05$). This study result is supported by **Paul and Das (2022)** in West Bengal, India who reported that intradialytic stretching exercises were an effective method in reducing patients' level of muscle cramps. In addition, **Shraida et al. (2021)** in Iraq 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 was observed. This result signifies the effectiveness of intradialytic stretching exercises.

Regarding stress level pre/ post -intervention, the present study results clarified that no significant difference was observed among control group pre/post intervention. Although, there was a significant difference between pre and post level of stress among the studied patients. Initially, just over one-third of these patients reported being free from stress, that improved to over half post-intervention, indicating a significant positive shift. This finding is consistent with several studies conducted globally that highlight the psychological benefits of intradialytic exercise. For instance, **Elsayed Rady et al. (2020)** in Egypt who, reported that regular intradialytic exercises significantly reduced stress and anxiety among elderly dialysis patients, emphasizing the positive impact of physical activity on mental health. Similarly, **Ali et al. (2023)** in Egypt found that physical activity, including stretching exercise, reduced stress by enhancing overall well-being and reducing the perception of pain and discomfort during dialysis.

Concerning relation between characteristics of the studied older patients in the study group and their total level of muscle cramps pre/post-intervention and linear regression

The current study results displayed highly statistically significant relations between studied elderly patient's level of muscle cramps and age post intervention. In addition, there were statistically significant relations with place of residence and sufficiency of monthly income pre/ post -intervention. Also demonstrated that male sex was a statistically significant independent positive predictor of the muscle cramps. In addition, being divorced, craft work (before retirement) and living with one of sones were highly statistically significant independent positive predictors of the muscle cramps.

Similar findings were reported by **El-Saidy (2025)** in Egypt, who identified age as a primary risk factor for muscle cramps in elderly patients due to declining muscle function and physical activity. It may be due to the natural decline in muscle function and reduced physical activity with age, resulting in weaker muscles, less flexibility, and poorer circulation, which together increase the risk of cramps during hemodialysis**.**

In addition, **Ghonemy et al. (2016),** in El-Sharkia, Egypt, reported that chronic renal failure is more prevalent in rural areas compared to urban settings, also noted that complications such as muscle cramps were more frequently observed in rural patients, which supports the current study's finding that elderly hemodialysis patients residing in urban areas experienced significantly lower levels of muscle cramps. And**, Faioli et al. (2024)** in Italy and **Tsirigotis et al. (2022)** in Greece found that individuals who had sufficient income were more likely to experience fewer cramps. This may be attributed to their better access to a nutritious diet, health supplements, and more effective self-care practices.

Similarly, a study conducted by **Chatrenet et al. (2023)** in France demonstrated that male sex is associated with a higher likelihood of neuromuscular fatigability among elderly patients with chronic kidney disease. This finding could be attributed to physiological or occupational differences between males and females, men often have greater muscle mass that can be more affected by fatigue, hormonal differences that influence muscle endurance, and possibly different patterns of physical activity or comorbidities compared to women. Also, **Alqalah et al. (2025)** in Saudi Arabia illustrated that marital status and personal living conditions were found to have a significant impact on both the quality of life and the frequency of muscle cramps. Specifically, patients who were married, employed, and living with their families tended to report significantly better health-related QoL and fewer muscle cramps. This disparity may be largely explained by the greater social support and emotional stability typically associated with marriage and family living arrangements. On the other hand, another study by **Atik et al. (2016)** in Turkey, illustrated that muscle cramps showed statistically significant differences between men and women, it was more commonly seen in women.

Relation between characteristics of the studied older patients in the study group and their total level of stress pre/post-intervention and linear regression

The present study results revealed statistically significant associations between total stress levels and sociodemographic factors including age, educational level and sufficiency of monthly

income both before and after the intervention. In addition, female sex and being housewife (before retirement) were statistically significant independent positive predictors of the stress score. Also, current work with effort and living with relatives were statistically significant independent positive predictors of the stress score.

These findings align well with study conducted by **Naganandini (2024)** in India illustrated that, age was significantly related to stress indicating that older adults tend to experience higher stress levels. The educational level also exhibited a significant correlation with stress. In addition, financial status also had a positive coefficient indicating that financial resources relate to varying levels of stress, financial strain can significantly influence stress in diverse ways. Also, another study in USA by **Marshall et al. (2021)** revealed that, financial sufficiency emerged as a key factor, with patients reporting adequate or saving monthly income experiencing lower stress.

In the same line, study by **Tu et al. (2023)** in China illustrated that sex differences in stress have been widely documented. Women often report higher stress levels due to a combination of biological, psychological, and social factors. Besides, study by **Taylor (2022)** in London showed that being housewife was a significant predictor of stress levels**.** Unlike individuals with formal employment experience, housewives may have had limited access to structured coping mechanisms — such as workplace support networks, steady income, or pensions — making them more vulnerable to stress during times of dependency or chronic illness.

Also, **Hejazi et al. (2021)** in Egypt, illustrated that hemodialysis patients who perceived a lack of autonomy or burdened their caregivers especially relatives reported significantly higher psychological stress.

Ultimately, this result is consistent with a study conducted in India by **Mahdavi (2016)**, which reported significant associations between anxiety, stress, and depression and various demographic factors, including age, gender, marital status, economic status, and education level.

Also, muscle cramps showed significant positive correlations with stress pre/ post-intervention. These results are supported by **Doan et al. (2024)** from Canada, who reported a positive association between muscle cramps and stress.

Conclusion

The study findings were concluded that hypertension and diabetes were the leading causes of renal failure among elderly, Gastrocnemius muscle cramp was the commonly experienced at the end of hemodialysis sessions which were held three times per week for four hours. What is more, albeit no substantial difference between pre and post assessment was observed among control group in muscle cramp and stress level; intradialytic stretching exercises proved to be an effective tool in alleviating muscle cramps and reducing level of stress among elderly patients undergoing hemodialysis.

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Declaration of Conflicting Interests

The Author(s) declare(s) that there is no conflict of interest.

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Table 1: Elderly patient's muscle cramps level pre and post intervention in the study and control groups (n=100)

Muscle cramps	Group	Pre Mean ±SD	Post Mean ±SD	Index score	Paired t-test	P. value
Frequency of cramps	Study	1.46±0.50	0.50±0.67	0-2	7.93	**0.000****
	Control	1.58±0.49	1.54±0.50		1.43	0.159
	^P value	1.21 0.228	8.79 **0.000****			
Duration of the cramps	Study	1.60±0.49	0.50±0.68	0-2	10.58	**0.000****
	Control	1.58±0.49	1.56±0.47		0.21	0.835
	^P value	0.20 0.838	9.06 **0.000****			
Level of pain	Study	2.18±0.89	0.46±0.67	0-3	10.47	**0.000****
	Control	2.28±0.73	2.22±0.58		0.45	0.650
	^P value	0.61 0.540	14.12 **0.000****			
Temperature	Study	1.48±0.50	0.38±0.66	0-2	8.35	**0.000****
	Control	1.36±0.48	1.34±0.43		0.44	0.659
	^P value	1.22 0.22	8.61 **0.000****			
Discomfort	Study	2.64±1.22	0.56±0.71	0-4	10.87	**0.000****
	Control	2.28±1.29	2.18±1.24		0.39	0.693
	^P value	1.43 0.154	8.02 **0.000****			

^ Independent t-test. *Significant at p ‹0.05. **Highly significant at p ‹0.01

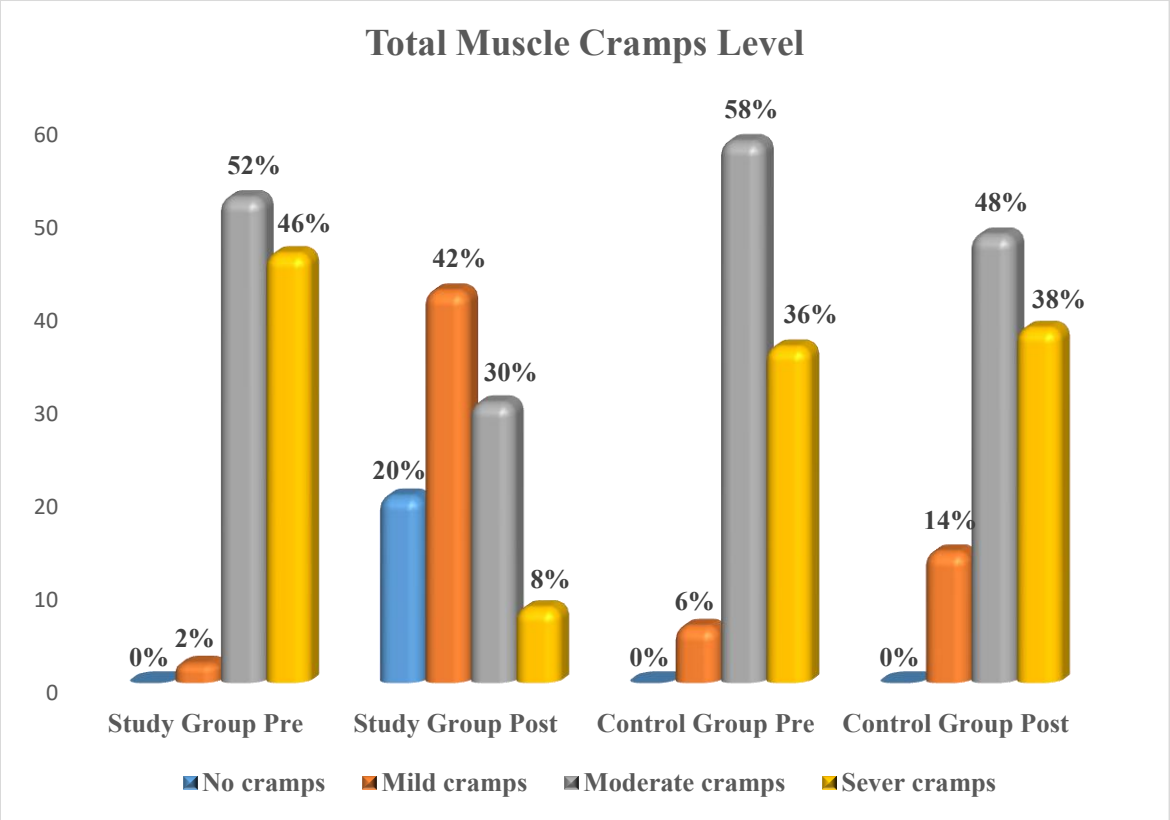

Figure 1: Elderly patient's total muscle cramps level pre/ post -intervention in the study and control groups (n=100)

Table 2: Elderly patient's total stress level pre and post intervention in the study and control groups (n=100)

Stress	Study group				Control group				X^2 test	P. value
	Pre		Post		Pre		Post			
	No	%	No	%	No	%	No	%		
Normal	19	38.0	26	52.0	13	26.0	8	16.0	2.85^c	0.582
Mild	5	10.0	12	24.0	8	16.0	7	14.0	25.46^d	0.000**
Moderate	12	24.0	10	20.0	14	28.0	17	32.0		
Severe	6	12.0	1	2.0	9	18.0	10	18.0		
Extremely sever	8	16.0	1	2.0	6	12.0	8	12.0		
	X^2 test 13.16[a] P. value 0.010*				X^2 test 1.88[b] P. value 0.756					

*Significant at p ‹0.05. **Highly significant at p ‹0.01. Not significant at p>0.05

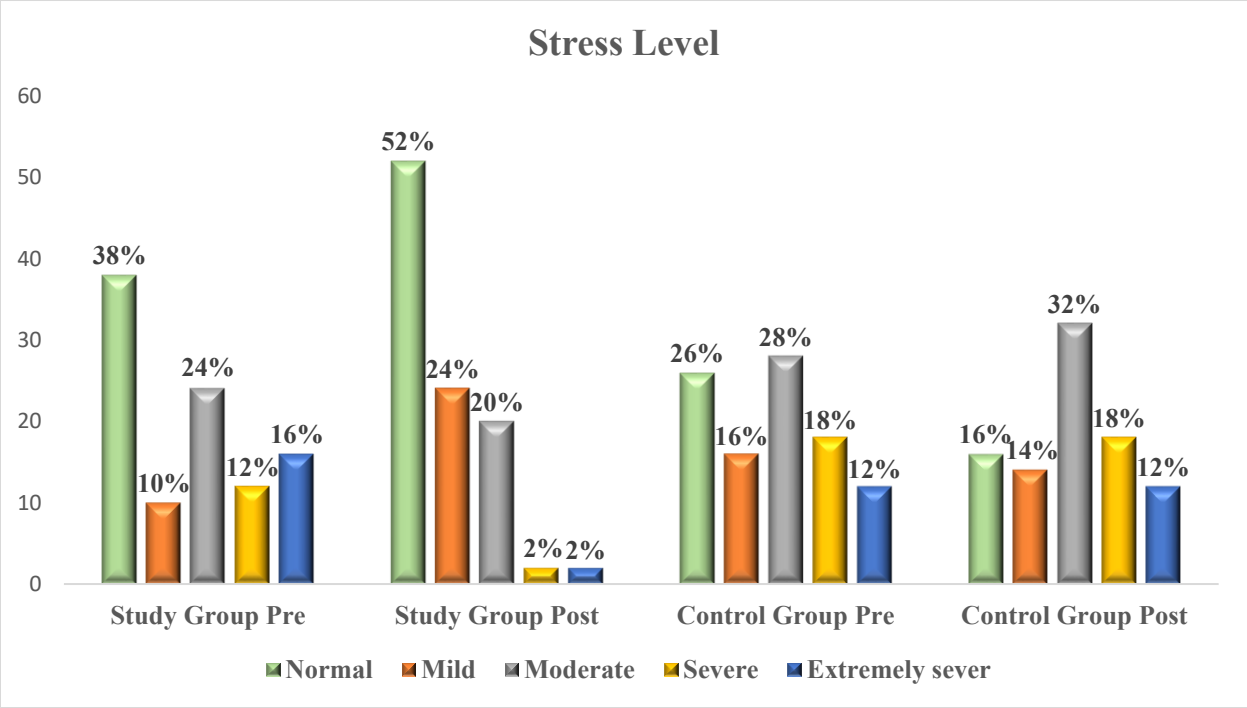

Figure 2: Elderly patient's total stress level pre/ post -intervention in the study and control groups (n=100)

Table 3: Relation between characteristics of the studied elderly patients in the study group and their total level of muscle cramps pre/ post -intervention

Demographic characteristics	Pre			Post		
	Mean ±SD	T test	P. value	Mean ±SD	T test	P. value
Age (years)						
60 - <65	8.88±2.17	1.97	**0.030***	2.17±1.08	2.76	**0.008****
65 and more	9.84±3.05			2.92±0.83		
Sex						
Male	9.07±2.83	1.09	0.30	1.56±1.50	15.18	**0.000****
Female	9.70±2.47			3.39±3.65		
Place of residence						
Rural	9.03±2.53	0.06	0.80	2.83±3.23	7.54	**0.008****
Urban	10.13±2.90			1.40±1.12		
Marital status						
Single	8.00±1.41	Anova 0.84	0.48	5.50±3.36	Anova 2.71	**0.041***
Married	9.96±9.96			3.17±2.93		

Widow	8.85±2.89			1.45±2.23		
Divorced	9.00±3.83			1.00±0.82		
Level of education						
Illiterate	9.07±2.32	Anova 7.14	**0.000****	3.41±2.43	Anova 4.79	**0.002****
Reads and writes	6.57±1.13			0.29±0.76		
Primary and preparatory school	9.33±1.15			2.00±1.00		
Middle school (Secondary)	12.83±1.83			1.00±0.89		
University	10.29±2.75			2.00±1.00		
Occupation before retirement						
Employee	9.92±2.18	Anova 0.56	0.65	1.46±1.05	Anova 3.06	**0.037***
Farmer	8.69±3.16			1.50±1.79		
Craft	9.36±2.66			1.00±2.83		
Housewife	9.50±2.61			3.80±3.75		
Current occupation						
No work	9.80±2.93	Anova 0.32	0.810	1.95±1.50	Anova 2.17	0.104
Work with effort	9.40±1.82			0.40±0.55		
Work without effort	9.00±2.67			3.29±3.61		
Living arrangements						
Alone	8.00±1.83	Anova 5.55	**0.002****	5.75±4.92	Anova 4.94	**0.004****
With husband /wife	6.00±2.66			3.17±2.93		
With one of sons	9.25±3.02			1.05±0.94		
With another relative	9.96±2.33			2.40±2.84		
Sufficiency of monthly income						
Sufficient and saving	8.43±2.64	Anova 2.56	0.088	1.29±1.49	Anova 3.30	**0.045***
Sufficient	10.15±2.34			3.35±3.40		
Not sufficient	8.53±2.89			1.41±1.62		

*Significant p ‹0.05. **Highly significant p ‹0.01. Not significant p>0.05

Table 4: Relation between characteristics of the studied elderly patients in the study group and their total level of stress pre/ post -intervention

Demographic characteristics	Pre			Post		
	Mean ±SD	T test	P. value	Mean ±SD	T test	P. value
Age (years)						
60 - <65	11.52±5.67	1.29	0.201	6.20±3.39	2.52	**0.014***
65 and more	9.54±4.95			8.08±1.88		
Sex						
Male	12.15±5.54	2.43	0.018	8.74±1.21	3.35	**0.001****
Female	8.61±4.56			6.70±2.90		
Place of residence						
Rural	10.29±5.35	0.03	0.95	7.86±3.66	3.44	0.070
Urban	11.07±5.56			7.13±1.84		
Marital status						
Single	6.00±1.41		0.597	7.00±1.00		0.589

Married	11.13±4.27	Anova 0.63		8.29±4.09	Anova 0.65	
Widow	10.50±6.61			6.95±2.33		
Divorced	9.25±5.90			7.50±0.58		
Level of education						
Illiterate	9.44±5.48	Anova 2.31	0.072	8.63±2.45	Anova 3.29	**0.018***
Reads and writes	15.00±6.19			5.43±2.05		
Primary and preparatory school	10.67±6.35			6.33±1.53		
Middle school (Secondary)	7.83±3.25			6.50±1.87		
University	12.43±2.15			7.57±2.82		
Occupation before retirement						
Employee	9.77±3.94	Anova 5.09	**0.004****	7.31±2.29	Anova 3.46	**0.024***
Farmer	13.75±5.82			6.13±1.96		
Craft	18.00±5.37			5.00±3.22		
Housewife	8.05±4.38			9.20±3.94		
Current occupation						
No work	9.85±5.05	Anova 0.59	0.621	7.35±2.23	Anova 2.62	0.062
Work with effort	10.60±3.78			5.20±2.49		
Work without effort	10.79±5.96			8.58±3.71		
Living arrangements						
Alone	8.25±7.09	Anova 0.60	0.615	7.75±2.50	Anova 0.96	0.420
With husband /wife	11.13±4.27			8.29±4.09		
With one of sons	9.40±5.82			7.10±1.97		
With another relative	10.52±5.36			5.00±1.41		
Sufficiency of monthly income						
Sufficient and saving	13.43±4.43	Anova 1.95	Anova 0.153	6.14±2.12	3.21	**0.046***
Sufficient	9.27±4.81			8.69±3.61		
Not sufficient	11.24±6.16			6.65±2.44		

*Significant p ‹0.05. **Highly significant p ‹0.01. Not significant p>0.05

Table 5: Best fitting multiple linear regression model for total muscle cramps score

Items	**Unstandardized Coefficients**	**Standardized Coefficients**	**T test**	**P. value**
	B	**B**		
Sex (male)	0.058	0.024	2.39	**0.021***
Marital status (divorced)	0.092	0.371	2.76	**0.008****
Occupation before retirement (craft)	0.170	0.380	2.85	**0.006****
Living arrangements (living with one of sones)	0.127	0.514	4.15	**0.000****
Model	**R2**	**Df.**	**F**	**P. value**
Regression	**0.41**	**3**	**9.82**	**0.001****

a. Dependent Variable: Muscle Cramps Score
b. Predictors: (constant): Sex, Marital status, Occupation before retirement and Living arrangements.

Table 6: Best fitting multiple linear regression model for total stress score

Items	Unstandardized Coefficients	Standardized Coefficients	T test	P. value
	B	B		
Sex (female)	0.048	0.305	2.22	**0.031***
Occupation before retirement (house wife)	0.126	0.321	2.35	**0.023***
Current occupation (work with effort)	0.319	0.246	5.14	**0.001****
Living arrangements (living with relative)	0.270	0.273	3.23	**0.002****

Model	R2	Df.	F	P. value
Regression	**0.38**	**3**	**12.54**	**0.002****

a. Dependent Variable: Stress Score
b. Predictors: (constant): Sex, Occupation before retirement, Current occupation and Living arrangements.

Table 7: Correlation between studied variable pre/ post-intervention among the studied elderly patients in the study group

	Items	Muscle cramps	Stress
Pre	**Muscle cramps**		.310* **.028**
	Stress	.310* **.028**	
Post	**Muscle cramps**		.541** **.000**
	Stress	.541** **.000**	

*Significant p ‹0.05. **Highly significant p ‹0.01. Not significant p>0.05

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