Effect of Jacobson's Progressive Muscle Relaxation on Fatigue and Sleep Quality among Geriatric Patients Undergoing Hemodialysis

Aziza Mahmoud Boughdady [(1)], Neamit Ibrahim Elemam Elashri [(2)], Sally Mohammed Elsayed Ibrahim [(3)*]

[(1,2)]Assistant professor of Gerontological Nursing, Faculty of Nursing, Mansoura University, Egypt
[(3)*]Lecturer of Gerontological Nursing, Faculty of Nursing, Mansoura University, Egypt
* E-mail of corresponding author: sallymohammed@mans.edu.eg

Abstract

Background: Geriatric patients undergoing hemodialysis often grapple with persistent fatigue and poor sleep quality, which can significantly impact on their daily functioning and contribute to a diminished quality of life. Jacobson's progressive muscle relaxation, a structured technique involving the systematic tensing and subsequent relaxation of muscle groups alleviating theses hemodialysis consequences. **Aim of the study** was to evaluate the effect of Jacobson's progressive muscle relaxation on fatigue and sleep quality among geriatric patients undergoing hemodialysis. **Subjects and Methods: Research design:** A Quasi-experimental research design using one group pre-post 1and post2 test was used. **Setting:** The study was conducted in the dialysis units of Mansoura University Hospital and New Mansoura General Hospital. **Subjects:** A purposive sample of 61 geriatric patients who diagnosed with end-stage renal failure and on regular hemodialysis for at least 6 months. **Tools of data collection:** The data were collected through Mini– Mental State Examination, Structured interview schedule sheet, The Multidimensional Fatigue Inventory Scale and The Pittsburgh Sleep Quality Index. **Results:** The mean age of the studied geriatric patients was 67.869±4.863 years, a statistically significant change in fatigue level and sleep quality Index among the studied geriatric patients after application of Jacobson's progressive muscle relaxation (P=0.000**) was observed. **Conclusion:** implementation of Jacobson's progressive muscle relaxation evidenced to be effective in reducing the fatigue level and improving sleep quality among geriatric patients undergoing hemodialysis. **Recommendation:** For hemodialysis patients, practicing Jacobson's progressive muscle relaxation regularly is recommended to lessen fatigue and improve sleep quality.

Keywords: Fatigue; Geriatric Patients; Hemodialysis; Jacobson's progressive muscle relaxation; Sleep quality.

Introduction

The combination of age-related decline in kidney function and renocardiovascular risk factors frequently results in the diagnosis of chronic kidney disease among geriatric patients. Numerous bodily systems are impacted by the ensuing uremia [(1,2)]. End-stage renal disease (ESRD) is usually asymptomatic until it manifests [(3)]. Around 40% of persons with sixty five years and older have chronic kidney disease (CKD) worldwide. They have the highest prevalence of chronic kidney disease in the United States (38%) compared to all other age groups [(2)]. With an estimated 74 cases of chronic kidney disease per million and 264 cases of dialysis patients overall, chronic kidney disease is a major public health concern in Egypt. Putting it as the fifth most common cause of mortality in the nation between 2009 and 2021[(4)].

As life expectancy increase, the use of hemodialysis (HD) to support the geriatric patients with end stage renal disease has increased as well. Geriatric patients undergoing hemodialysis are more susceptible to a wide range of hemodialysis related complications, such as hypotension, muscle cramps, severe fatigue, sleep disturbance, and decreased physical activity due to the combination of physiological aged related changes, In addition, concomitant geriatric syndromes and the health consequences of end stage renal disease [(5)]. Fatigue is a prevalent and debilitating issue and common

complaints among geriatric patients undergoing hemodialysis affecting a staggering 92.2% and significantly impacting their quality of life [6].

One of the most fundamental human needs and a critical component of health is sleep, according to Maslow's hierarchy of needs. Worldwide, 50–80% of dialysis patients have trouble sleeping [7]. Maintaining good health and leading an active life, both physically and intellectually, depend on getting enough sleep. One of the most common problems among geriatric patients undergoing hemodialysis is poor sleep quality [8]. For a variety of causes, including aging-related changes to their sleep architecture and patterns, geriatric patients undergoing hemodialysis are more susceptible to experience poor sleep quality and significant fatigue. Older people usually sleep less deeply, more irregularly, and wake up more frequently during the night. For geriatric patients undergoing hemodialysis, these age-related changes may make sleep issues worse [9,10] .

Poor sleep quality is one of the key causes and predictors of the fatigue that geriatric patients undergoing hemodialysis suffer. Poor sleep quality can also affect these components of a patient's well-being, even if hemodialysis alone has a significant impact on a patient's health in many ways. Additionally, fatigue can impair a patient's quality of life and exacerbate pre-existing medical conditions. It has been shown that improving the sleep quality can reduce levels of fatigue in geriatric patients who experience difficulty falling asleep. This suggests that hemodialysis patients' sleep problems could be effectively treated in order to improve their overall health and wellness [7].

To overcome fatigue and poor sleep quality, both non-pharmacological and pharmaceutical management are used. But given that pharmacological management is costly and involves numerous unpleasant side effects, it is not often used as the primary line of management. Thus, in order to enhance nursing management, alternative non-pharmacological management techniques which are highly regarded for being accessible, non-invasive ,inexpensive, easy to adopt without any negative chemical effects must be pursued. The Jacobson progressive muscular relaxation technique is one of these alternative relaxation techniques [11, 12].

Jacobson progressive muscle relaxation technique (JPMR) was developed at Harvard University by Dr. Edmund Jacobson in 1920 [13]. Since it is simpler to teach and understand than alternatives, it was initially offered as a more popular relaxation technique. Jacobson's progressive muscular relaxation works on the basis of first tensing the muscles, then relaxing them. Peace of mind and emotional equilibrium can be obtained by relaxation [14]. Jacobson's relaxation has become an essential part of care for patients with chronic diseases due to its various benefits, which include alleviating anxiety and tension, focusing attention away from pain, releasing tense and spasming muscles, encouraging sleep, and decreasing fatigue level [15].

Nurses play a crucial role in decreasing fatigue level and improving sleep quality among geriatric patients undergoing hemodialysis by identifying the factors that contribute to these problems [8] and implementing both standardized protocols and individualized support, for improving the well-being and survival rates of geriatric patients undergoing hemodialysis [16].

Significance of the study:

Geriatric patients undergoing hemodialysis often face the difficult combination of age, chronic kidney disease, and the needs of renal replacement treatment. It was noticed that fatigue and poor sleep quality are common problems that significantly impair the

general well-being [17]. Fatigue lowers the ability to complete normal tasks, interferes with familial and social responsibilities, diminishes self-care activities, and can increase reliance on medical care, all of which have a negative impact on the quality of life for patients. Compared to patients with normal kidney function, between 60 and 97% of hemodialysis patients report feeling of fatigue at some point [18 ,10].

Moreover, hemodialysis patients frequently experience poor quality sleep. At the same line, ***Kamal et al.*** [19] found that poor sleep quality affected 62.2% of Egyptian hemodialysis patients. Additionally, ***Elsayed et al.*** [20] discovered that almost 76.7% of hemodialysis patients had poor sleep quality. These combined results highlight the significant burden of fatigue and poor sleep quality experienced by geriatric patients undergoing hemodialysis for renal failure. They stress how urgently more nursing interventions are needed to lessen these problems.

A non-pharmacological method such as Jacobson's progressive muscle relaxation, one of the pharmaceutical alternatives, may prove to be more cost-effective .In addition, using a self-management technique that is simple to teach and practice on one's own can improve the patient's autonomy and sense of control and encourage a proactive approach to treating symptoms such as fatigue and poor sleep quality [21].Subsequently, the present study was conducted to determine the effect of Jacobson's progressive muscle relaxation on fatigue level and sleep quality among geriatric patients undergoing hemodialysis.

Aim of the study:

The aim of the study was to evaluate the effect of Jacobson's progressive muscle relaxation on fatigue and sleep quality among geriatric patients undergoing hemodialysis.

Specific objectives of the study:

- Assess fatigue level among geriatric patients undergoing hemodialysis.
- Measure the sleep quality among geriatric patients undergoing hemodialysis.
- Determine the relation between fatigue level and sleep quality among geriatric patients undergoing hemodialysis.

Research Hypothesis:

The Jacobson's progressive muscle relaxation will alleviate fatigue level and improve sleep quality among geriatric patients undergoing hemodialysis.

Subjects and methods:

Research Design:

Quasi-experimental research design using one group pre-post 1and post 2 test was used in this study. In which the same dependent variables were measured in one group of participants before (pretest) and after (posttest and follow up) an intervention was administered. Then compare between results. The advantages of this research design that we can compare scores post intervention to scores on the same measure in the same participants prior to intervention [22].

Study Setting:

The study was conducted on the Nephrology and Dialysis unit of Mansoura University Hospital that rival to Mansoura university (it was consisted of 29 bed that connected to the dialysis machines) and Dialysis unit of New Mansoura General Hospital (it was entailed of 59 bed that connected to the dialysis machines) that rival to Ministry of health .

Study Subjects:

A purposive sample of 61 geriatric patients who scheduled for maintenance hemodialysis in the previous revealed setting, and accomplishing the next

Inclusion criteria:

Aged sixty years and above, Able to communicate, diagnosed as end-stage renal failure and on regular hemodialysis

for at least six months, had fatigue based on the Multidimensional Fatigue Inventory Scale (MFI-20) score 20 and above, had normal cognitive function (Score from 24-30) according to Mini–Mental State Examination (MMSE)

Exclusion criteria:

- Have any problems in arteriovenous fistulas that require hospitalization in the three months prior except for vascular access repair.
- Have any physical impairment such as amputations or prostheses in lower extremities.
- Have any debilitating diseases as heart failure and cancer that may impede the prognosis.

Sample size Calculation:

Sample size was calculated for the paired sample (before-after study) using MedCalc software version 22.009 based on the following parameters: proportion of good sleep quality of geriatric pre/post Jacobson intervention"31.58%; 84.21% respectively" [14] with Type I error /Alpha=0.0.5 and Power = 99%, the beta error was 0.01, the calculated sample size was found to be 56; adding a 10% expected nonresponsive rate, the sample size was 61 cases were recruited to the study.

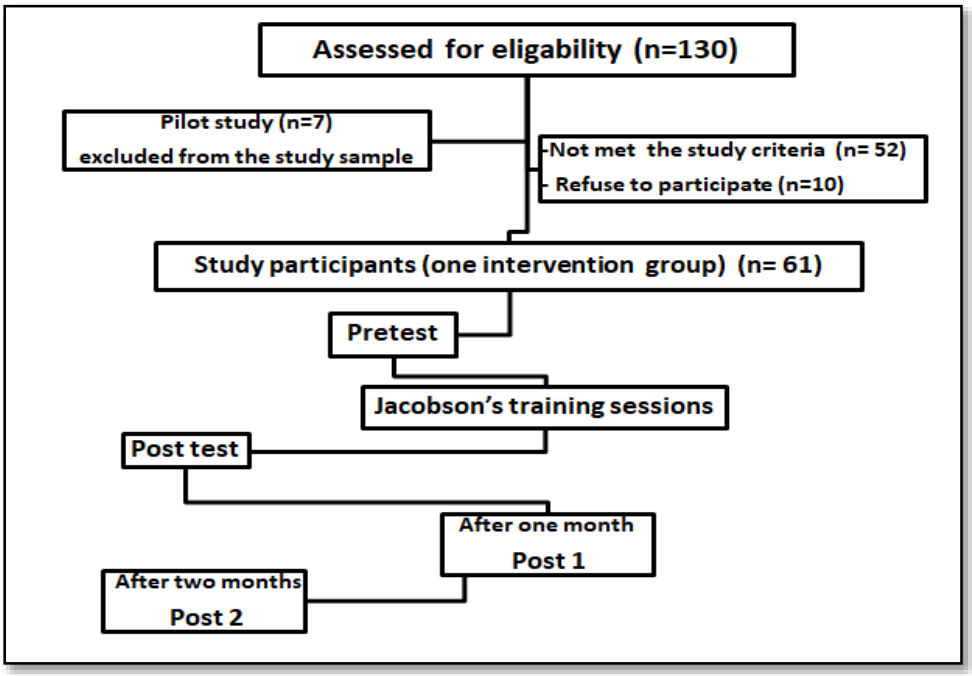

Figure A: Flow diagram for the study design and study participant

Tools for data collection:

Four tools were used for data gathering in this study.

Tool I: Mini – Mental State Examination (MMSE):

This scale was designed by **Folstien** [23] and translated into Arabic language by **Elokl** [24] validated and tested for its reliability by **Abd El Moniem** [25]. It was designed for evaluating the cognitive function of the geriatric people. Examining memory, orientation to time and place, calculation naming, registration, attention, repetition, praxis, language and copying of a design are all examined in these eleven items. Those with moderate to severe cognitive impairment were excluded using this method. The MMSE scale has a 30-point rating and is categorized as follows; Normal cognitive function (score 24-30), mild cognitive impairment (score 18-23) and severe cognitive impairment (score 0-17).

Tool II: Demographic characteristics and health history structured interview schedule:

This tool was developed by the researchers based on review of relevant

literatures [26,27,28,29,30] .

It consisted of two parts:

- ***Part I: Demographic characteristics of geriatric patients:*** It included data as age, sex, marital status, educational level, monthly income, occupation before retirement, residence and living condition.
- ***Part II: Health history related data of geriatric patients:*** It included data such as causes, onset of chronic renal failure, onset of starting hemodialysis, hemodialysis session's number and presence of other disease.

Tool III: The Multidimensional Fatigue Inventory Scale (MFI-20):

This tool was established by***Smet et al.,*** [31] then ***Abd Elhameed and Fadila***[32] validated its validity and reliability after translating it into Arabic language. It was used to evaluate fatigue level. There are five subscales on the scale; general fatigue, mental fatigue, physical fatigue, reduced activity and reduced motivation. Each subscale has four elements on it. There are twenty total scale items, with an equal distribution of negatively and positively worded items. The score is obtained using a five-point Likert scale, where one represents "yes," and five represents "no," respectively. The global weariness score ranged from 20 to 100. To classify the degree of weariness, three categories were employed: mild fatigue (20–44), moderate fatigue (45–71), and severe fatigue (72–100). A high score indicates a high fatigue level.

Tool V: The Pittsburgh Sleep Quality Index (PSQI):

This scale was established by ***Buysse, et al,*** [33]. It is a useful tool for evaluating older adults' quality and patterns of sleep. It was translated into Arabic language and tested for its validity and reliability by ***Asaad and Kahla.,*** [34].It distinguishes poor from good sleep through assessing seven domains; subjective sleep quality, sleep latency "as how long it takes to fall asleep?", sleep duration, habitual sleep efficiency "as How much time in bed that one is asleep?", sleep disturbances, use of sleeping medication, and daytime dysfunction. Seven component scores are derived, ranging from zero (no difficulty) to three (severe difficulty) are used to score the PSQI. The global score (range 0 - 21) is obtained by adding the component scores. Scores that are lower suggest better sleep quality. However, scores that are higher indicate worse sleep quality. A score of five or higher indicates that the individual has poor sleep quality (a sleep problem). A total score of less than five suggests good sleep quality.

Method

I. Preparatory phase

- An official approval was sent from the Faculty of Nursing, Mansoura University to the directors of the previous settings.
- After being made aware of the study's aim and the timing of data collection, the directors of Mansoura University's dialysis unit and New Mansoura General Hospitals granted permission to conduct the study.
- The study tool II (Demographic characteristics and health history structured interview schedule was established by the researchers once relevant literatures were reviewed.
- The Arabic versions of tool I (Mini-Mental State Examination), tool III (Multidimensional Fatigue Inventory Scale "MFI-20"), and tool V (Pittsburgh Sleep Quality Index "PSQI") were used for data collection. The r coefficient (r =0.93, r =0.88, and r = 0.85, respectively) assured the reliability.
- Before beginning the data collection procedure a pilot study was done on ten percent (seven) of geriatric patients undergoing hemodialysis at the Mansoura University dialysis unit to determine the study tools' clarity, and applicability. Those patients were excluded from the study sample and the necessary modifications were done.
- Subsequent viewing of related literatures and the outcomes of the study participants' pre assessment, the recommended Jacobson's progressive muscle relaxation training sessions were developed and implemented for the study participants. The researchers created a

simple Arabic booklet with illustrations, participants were given printed copies, and high text sizes for presentations. Experts then assessed the credibility in order to confirm the quality and correctness of the content.

- In order to ensure ethical compliance, the study was approved by the Mansoura University Faculty of Nursing Research Ethics Committee (**Approval No: P. 0528**). Every geriatric patient gave their informed consent, underlining their freedom to withdraw at any moment and the voluntary nature of their involvement. The information provided by participants was handled with confidentiality and anonymization, guaranteeing privacy, security, and confidentiality. The fact that their data would only be utilized for study was disclosed to the participants.

II- Implementation phase (Field work)

The study's multi-step data collection process was carried out between the middle of September 2023 to the end of December 2023.

- The researchers reviewed the literature before developing the Jacobson's progressive muscle relaxation for geriatric patients [35,36,37,38,39,40,41].
- A thorough explanation of Jacobson's progressive muscle relaxation demonstration was given to each patient, and redemonstration was conducted. The Jacobson's progressive muscle relaxation technique was applied to each patient individually. Every week, the researchers spent three days in the hemodialysis unit and apply the Jacobson's progressive muscle relaxation technique to three to five geriatric patients daily.
- Over the period of a month, six sessions of the Jacobson's progressive muscle relaxation was conducted as ***Figure (B)***. Depending on the geriatric patient's attention span and the necessary tasks that needed to be completed in each session, each one lasted between 20 and 25 minutes.

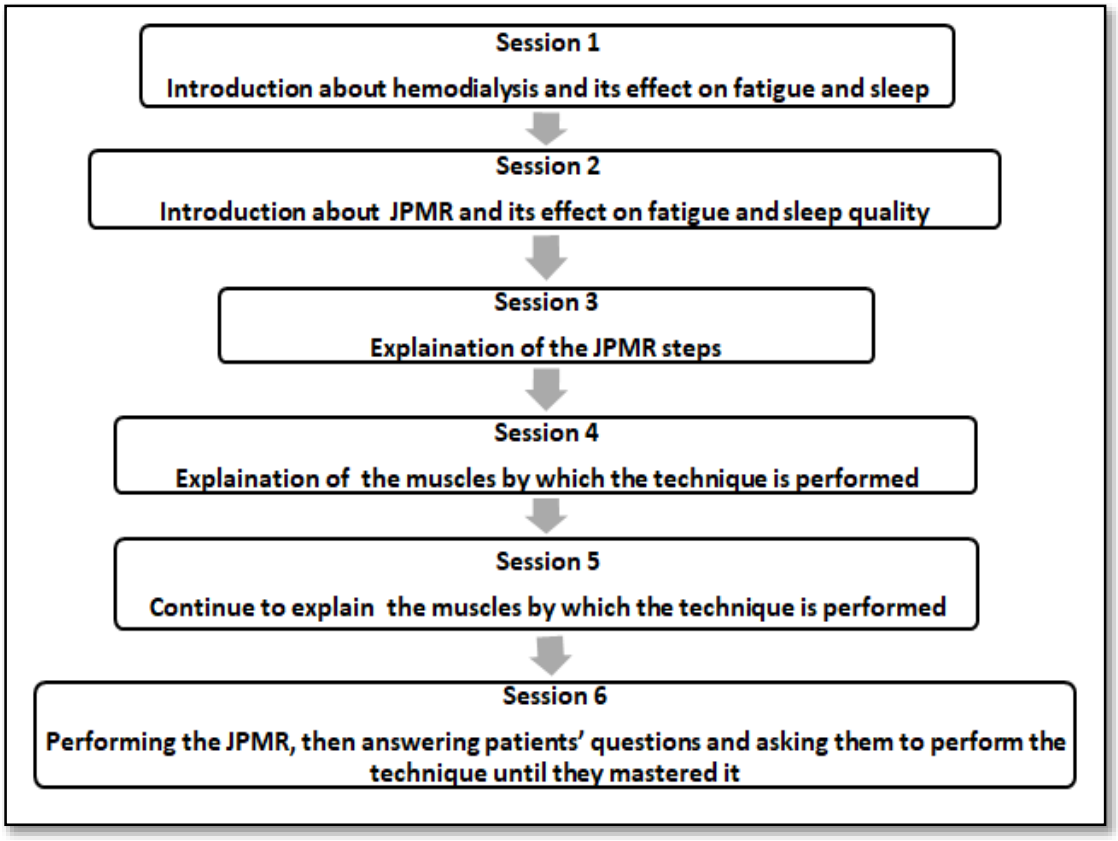

Figure (B) : Six Jacobson's progressive muscle relaxation training sessions

- Once geriatric patients are connected to the dialysis machine, the Jacobson's progressive muscular relaxation starts to take place after thirty minutes.
- At the beginning of first session, the researchers introduce themselves to patients and explain the purposes and content of the program.
- The next sessions, beginning with brief summary about the previous session and answer any questions.
- For fourteen different muscle groups including the facial muscles (frontal, levator palpebrae superioris, mandibular, and orbicularis oris), the neck, fingers, palms, forearms, arms, shoulders, back, chest, abdomen, gluteals, thighs, shanks, and plantar muscles, the Jacobson's progressive muscle contraction and relaxation was used. Each muscle took five and ten seconds to contract and release, accordingly.

- **Steps of the Jacobson's progressive muscle relaxation as the following:** geriatric patients instructed to follow this step at their home:
  - Sit on a comfortable chair and remove his/her shoes
  - Dim the lights and turn off computers, televisions, and phones.
  - To start, close his/her eyes, take two deep breaths and exhale slowly. Do not hold his/her breath.
  - Gently contract each muscle group as shown in the sequence below.
  - Hold the tension for five seconds.
  - Relax the muscles for about ten seconds.
  - Move to the next muscle group in the sequence as ***Figure (C).***

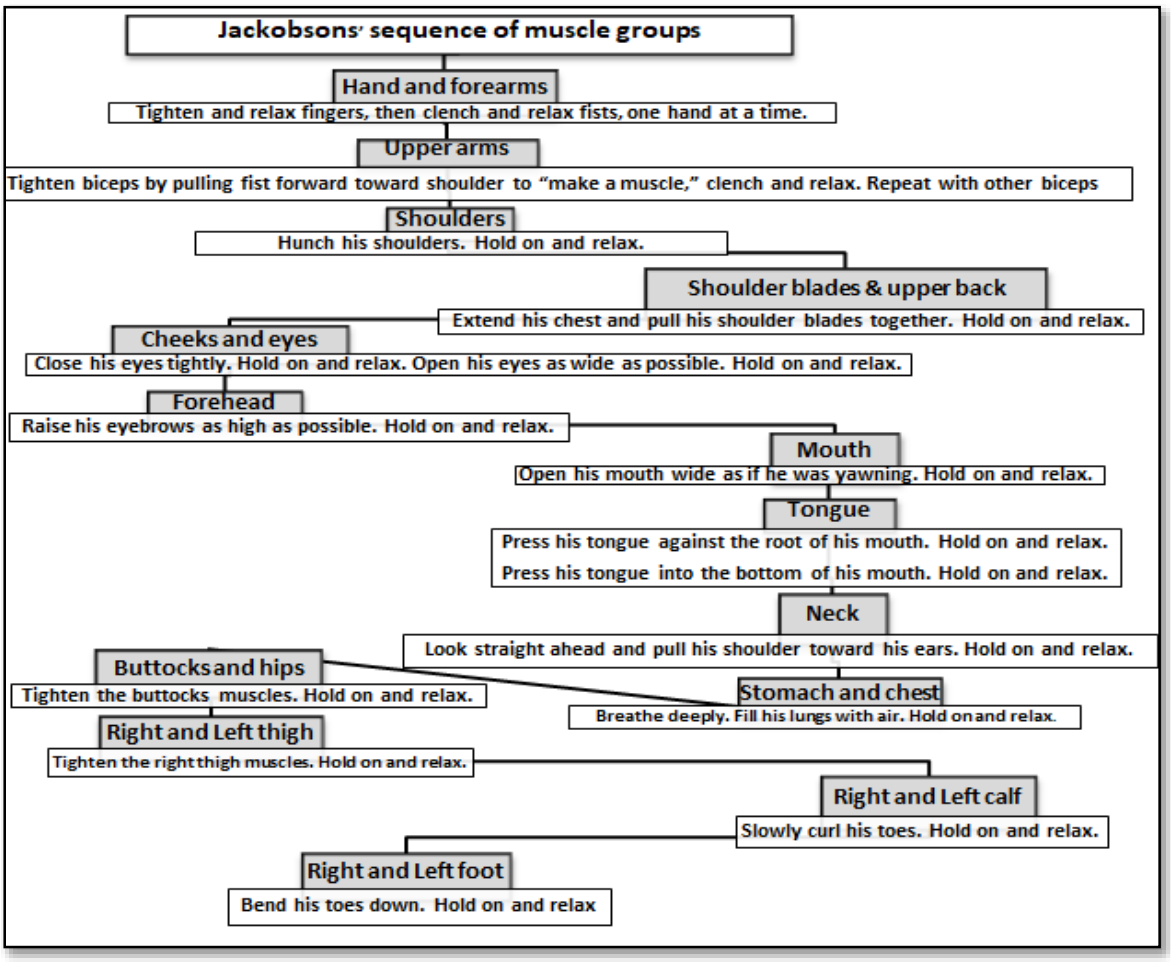

Figure (C): Muscle group sequence during Jacobson's progressive muscle relaxation

- The patients had to focus on the muscles that were contracting and relaxing during the entire procedure. Ultimately, the patient was instructed to relax their whole

body, take two deep breaths, open his eyes gradually, and resume his normal condition.

- Following the training, Geriatric patients were directed to repeat Jacobson's progressive muscle relaxation twice a day, in the morning and before going to bed, for ten to fifteen minutes at home for a period of two months.
- The geriatric patients were given a checklist, and they were asked to record the day, time, and length of the technique as well as, if applicable, the reason they were unable to finish it. Every week, the patients provided this relaxation checklist to the researchers.
- An audiovisual DVD and pictures as well as booklet pertaining to Jacobson's progressive muscle relaxation were provided to geriatric patients in order to assist them in practicing the technique on their own homes. These materials provide instruction and serve as reminders for their daily practice.
- In addition, patients could join and engage with the researchers via a WhatsApp group or get in touch with them directly in order to reorganize communication and address any queries or worries. Additionally, participants received a weekly phone call from researchers to address any concerns and guarantee that the Jacobson relaxation technique was being applied.
- The time taken with each geriatric patient to fulfill the study tools was ranged from twenty to thirty minutes.

III- Evaluation phase

After implementing Jacobson's progressive muscle relaxation, each geriatric patient was evaluated after one month of application of Jacobson's progressive muscle relaxation. ***(Post1)*** and after two months later ***(Post2)*** to evaluate the effectiveness of Jacobson's progressive muscle relaxation on fatigue level, and sleep quality of geriatric patients undergoing hemodialysis[42].

Statistical Analysis

`Statistical Package for Social Sciences (SPSS) Version 22 was used to analyze the collected data. Numbers and percentages were used to represent the qualitative variables. In the form of frequencies, mean, standard deviation, minimum, and maximum; the descriptive statistics were derived. Normality of the study variables was tested by using Kolmogrov Smironov test. A paired (t) test was used to compare the mean score between both studied variables; Numeric quantitative data were compared using independent t-tests and One-way ANOVA test as suitable. Additionally, the correlation between the various study variables was assessed using Pearson's correlation coefficient (r). The significance level was established at $p \leq 0.05$ and the p-value ≤ 0.05 was considered significant and less than 0.001 as highly significant. Also, to visualize the data, the graph was created by Microsoft Excel.

Results:

Table (1): Represented that the mean age of the studied geriatric patients was 67.869±4.863 years, Males were constituted (65.6%) of the studied geriatric patients. 82% of them were married, 55.7% of them had primary & secondary education. 77% of studied geriatric patients stated that their monthly family income was not enough .The majority of them (91.8%) were lived with their family, and 73.8% of them were residing in urban area**.**

Table (2): Illustrated that, Hypertension was the most prevalent cause of chronic renal failure among the studied geriatric patients then diabetes mellitus followed by drugs (75.4%, 16.4% and 8.2% respectively), 75.4% of the studied geriatric patients were suffered from disease since 1 to 5 years. 57.4% of them had positive history related to disease, 68.9% of the studied geriatric patients were suffered from one disease. 88.5% of them had three sessions per week. In addition, 75.4% of the studied geriatric patients were started hemodialysis since less than 5 years, and

52% of them reported the duration of each session lasts four hours.

Figure (1): showed that, there was statistically significant decrease in the level of fatigue among the studied geriatric patients after one month (post1) and two month (post2) after application of Jacobson's progressive muscle relaxation than before as only 4.9% of the studied geriatric patients had mild level of fatigue compared to 85.2%, 80.3% of them after one month and two months respectively (P=0.000**).

Figure (2): revealed that, there was statistically significant improvement in sleep quality of the studied geriatric patients after one month (post1) and two month (post2) after application of Jacobson's progressive muscle relaxation than before(P=0.000). as only 6.6% of the studied geriatric patients had good sleep quality. While, 70.5%, 63.9 % of them had good sleep quality after one month and two months respectively.

Table (3): proved that statistically significant difference was established before application of Jacobson's progressive muscle relaxation and one and two months after the application**.** the total mean score of the fatigue before the application of Jacobson's progressive muscle relaxation was 83.03±11.52 lessened to 33.31±9.53 and 34.08±10.12 one and two months respectively after the Jacobson's progressive muscle relaxation application and the difference is statistically significant (P=0.000). Additionally, the total mean score of Pittsburgh sleep quality index (PSQI) of the studied geriatric patients was improved from 15.15±4.2 before Jacobson's progressive muscle relaxation application to 5.18±5.69 and 6.26±6.09 one and two months respectively after the program application. concerning the total mean score of PSQI and its subscales includes subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction) the difference is statistically significant (P=0.000).

Figures (3,4,5): indicated that, there was a highly significant positive correlation between total mean score of fatigue and total mean score of Pittsburgh sleep quality index among the studied geriatric patients one and two months after the application of Jacobson's progressive muscle relaxation at (P= 0.000)** .

Discussion:

Hemodialysis (HD) stands as the most generally therapeutic options within the field of dialysis. Fatigue and poor sleep quality are more common problems among hemodialysis geriatric patients that impair patients' clinical outcomes, reduced performance in daily life, delayed response times, memory and concentration problems **Sanad et al.,**[29] .

Monitoring clinical concerns that could affect patients undergoing hemodialysis and optimizing assessment and management are considered two of nurse's main duties. **Abd Elhameed & Fadila**[32]. Recently, researchers have become interested in using Jacobson's progressive muscular relaxation to treat physical and mental complications of chronic diseases and to lessen hemodialysis consequences. **Anggraini et al.**[43]describe it as a complementary, noninvasive, low-cost method that is accessible and free of side effects. It can be performed independently. The current study demonstrated that Jacobson's progressive muscle relaxation (JPMR) was beneficial in reducing of fatigue level and improving sleep quality of geriatric patients undergoing hemodialysis.

The current study was conducted on sixty-one geriatric patients undergoing hemodialysis the majority of them were young old. Males were more prevalent than females, most of them were married. More than half of the studied subjects had primary and secondary education; more than three quarter conveyed that their monthly income was not enough. The majority were lived with their family, nearly three quarter were residing in urban area**.** This is consistent with research result

conducted in India by **Vasantha & Gandhimathi** [44]. With regards to health history, hypertension was the most prevalent cause of end stage renal failure among the studied geriatric patients then diabetes mellitus followed by drugs. This may be attributed to hypertension is the main cause of renal failure through damaging blood vessels , reducing blood flow to the kidney causing glomerular damage. While, renal failure is a result of microvascular complication that accompanies diabetes. Likewise, diabetes mellitus is the chief reason for end-stage renal disease (ESRD).

The same finding was informed by a study done in Egypt by **Magdy.** [45] reported that hypertension prevailed among their studied subjects, followed by diabetes mellitus. Also, this finding is consistent with a previous study carried out in south India**,** where most of their participants had diabetes and hypertension as most common comorbidities **Manavalan et al.,** [46]. On the other hand a study conducted in India by **Vasantha and Gandhimathi** [44] reported that diabetes mellitus was the most common risk factor than hypertension for end stage renal disease.

Fatigue is one of the most suffering complications faced geriatric patients undergoing hemodialysis. It has not only impact on their daily life activities but also, it affects their health status **Bossola et al.** [47].The recent study showed a decrease in the total mean score of the fatigue one and two months after Jacobson's progressive muscle relaxation application than before it with statistically significant difference as only few percentage of the studied geriatric patients had mild level of fatigue compared to the majority of them have mild level after one month and two months respectively.

This result may be justified by Jacobson's progressive muscle relaxation reducing muscle tension and discomfort which contributing to a reduction in overall fatigue level. It has a stress-reducing effects, helping geriatric patients cope with the emotional and physical stressors associated with hemodialysis and enhance the overall quality of life as improved well-being and reduced fatigue Also; Jacobson's progressive muscle relaxation provides an alternative approach to addressing fatigue without the potential side effects associated with additional medications. Additionally, engaging in Jacobson's progressive muscle relaxation promotes self-care and empowers patients to actively manage their well-being and having sense of control that can positively impact their level of fatigue.

This is consistent with research conducted in Jordon by **Maloh, et al.,** [48] who observed that there was a statistically significant reduction in the physical, cognitive, psychosocial subscales and the total score of fatigue for the intervention group. Similar finding was found by another studies performed in Egypt by [49] **Ibrahim et al** [50]**;** in India by **Vasantha & Gandhimathi**[44]**; Vidisha & Chandrakant** [50] ; in Iran by **Javdan, et al** [51]**, Sajadi et al.,** [41] who mentioned that their participant showed significant reduction in fatigue score in the Jacobson progressive muscle relaxation group as Jacobson's relaxation technique was more effective in relieving fatigue.

Poor sleep quality experienced by geriatric patients undergoing hemodialysis is a common occurrence that presents as a symptom and can significantly impede their capacity for independent functioning and overall quality of life [52] .due to Jacobson's progressive muscle relaxation intervention simplicity, affordability and cost- effectiveness, the pervious mentioned intervention has consistently been acknowledged as one of the most effective complementary approaches used in improving sleep quality **Serin et al.,** [53] .

The total mean score of Pittsburgh sleep quality index (PSQI) of the studied geriatric patients was improved (decreased in PSQI score) after one month, and two months than before application of Jacobson's progressive

muscle relaxation with highly statistically significant difference ; As only few of the studied geriatric patients had good sleep quality level before while, the majority of them had good sleep quality one month and two months after application of Jacobson's progressive muscle relaxation. A statistically significant difference was established concerning PSQI subscales after one and two months from application of Jacobson's progressive muscle relaxation than before it contains; subjective sleep quality, sleep duration, latency of sleep, efficiency of sleep, sleep disturbances, sleep medication using, and daytime dysfunction correspondingly.

This result may be attributed this improvement for several reasons initially Jacobson's progressive muscle relaxation simplicity and accessibility. Secondly, Jacobson's progressive muscle relaxation serve as a coping mechanism by providing a structured and calming activity that helps patients transition into a more relaxed state conducive to sleep. It focuses on mental relaxation and mindfulness may indirectly improve sleep quality by boosting mood and emotional well-being, lastly Jacobson's progressive muscle relaxation is a powerful non-pharmacological valuable tool for better sleep intervention. Its calming techniques help manage stress and improve relaxation, offering a drug-free alternative with no risk of side effects.

In a similar vein, a study conducted in Egypt by **Abdelkhalek et al.** (54) found that Jacobson's relaxation technique significantly improved the quality of sleep once it was implemented. After relaxing, the samples' average overall score for sleep quality was noticeably lower than it was before. Furthermore, Also, a study done in Egypt by **Sayed and Younis** (55) that involved hemodialysis patients, revealed that relaxing techniques enhanced both the overall and dimension scores of sleep quality.

The same finding was reported by a study done in Egypt by **Sanad et al.,** (29) who found that the global PSQI, mean score reduced immediately and post implementing the training program. Also, this result was compatible with the findings of other studies conducted by **Dyah et al,** (56) in Indonesia and by **Vasantha and Gandhimathi** (44) in India who concluded that the sleep quality was significantly improved with Jacobson progressive relaxation technique among geriatric. Also, this result agreed with the findings of another studies were conducted in Iran by **Harorani et al,**(57)**; Mokhtari et al.,** (58) and in India by **Margi et al .,** (13) who mentioned that the score of each sleep quality dimension were significantly lower than before relaxation.

Fatigue and sleep quality often exhibit a mutual relationship; poor sleep quality can contribute to increased fatigue, and conversely, fatigue can make it more difficult to achieve restful sleep **Nassar et al.,** (59). The current study revealed a highly significant positive correlation between total mean score of fatigue and total mean score of Pittsburgh sleep quality index among the studied geriatric patients undergoing hemodialysis one and two months after application of Jacobson's progressive muscle relaxation**.** Similar finding was supported by a study carried out in Indonesia by **Siregar, et al.,** (60) who stated that there was a significant relation between fatigue and sleep quality, when fatigue level is relieved , the sleep quality of hemodialysis patients becomes better. This result was agreed with a study carried out by **Dardin, et al.,**(61) in Brazil who showed statistically significant correlations between PSQI and fatigue. On the other hand, another study performed in Turkey by **Özberk and Kocamaz** (62) who revealed a weak significant association between sleep quality and fatigue.

The researchers attributed the positive correlation for several reasons initially. Jacobson's progressive muscle relaxation is effective in reducing stress, potentially alleviating both fatigue and sleep-related issues. Secondly; Jacobson's progressive muscle relaxation directly targets muscle tension, promoting relaxation, as the muscles relax through Jacobson's progressive muscle relaxation, it may alleviate physical discomfort,

contributing to better sleep quality and reducing fatigue, thirdly; by engaging in systematic muscle relaxation and focusing on calming the mind, geriatric patients may experience a reduction in anxiety, potentially leading to improvements in both sleep quality and fatigue levels.

Finally, from our point of views, the present study concluded Jacobson's progressive muscle relaxation was significantly effective in enhancing sleep quality, as indicated by improvements in the global PSQI scale for sleep quality and reduction in total mean score of fatigue. The study further demonstrated that Jacobson's progressive muscle relaxation had positive effects on various aspects of sleep quality. Engaging in Jacobson's progressive muscle relaxation empowers geriatric patients to actively participate in managing both their fatigue and sleep quality, Jacobson's progressive muscle relaxation provides a non-pharmacological approach to decreasing both fatigue and sleep disturbances among geriatric patients undergoing hemodialysis.

Conclusion:

The study findings suggest that the implementation of Jacobson's progressive muscle relaxation proved to be effective in reducing the fatigue level and improving sleep quality among geriatric patients undergoing hemodialysis.

Recommendations:

Based on the results of the current study, the next recommendations were proposed:

- Encourage geriatric patients undergoing hemodialysis to practicing Jacobson's progressive muscle relaxation regularly in order to alleviate fatigue and improve sleep quality.
- More research on the effects of Jacobson's progressive muscle relaxation on a large number of geriatric patients suffering from various chronic conditions.
- Teaching Jacobson's progressive muscle relaxation to nurses, practicing it on hemodialysis patients, and comparing it to other complementary therapies can help hemodialysis patients in reducing fatigue and enhance their sleep.

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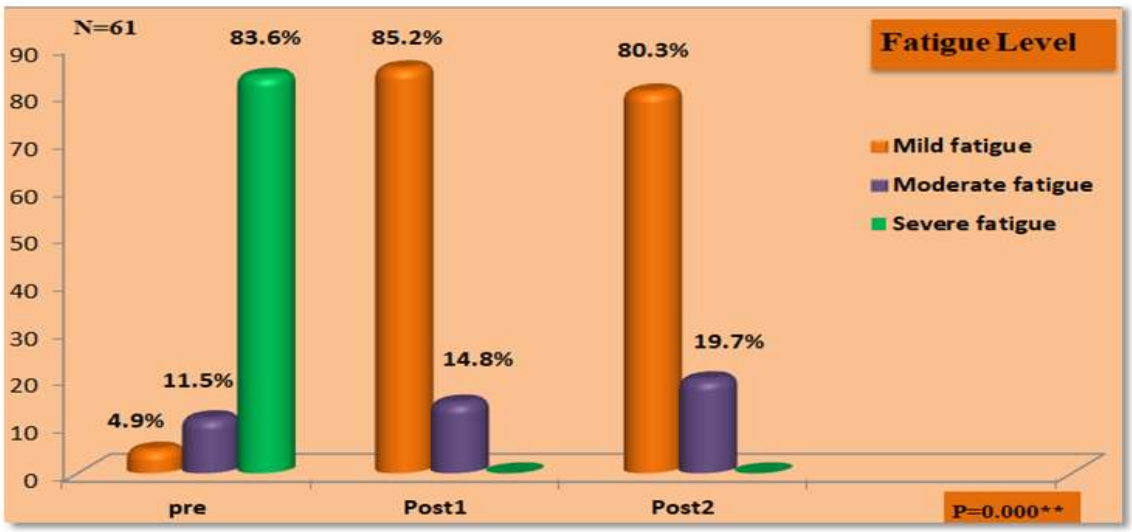
Table (1): Demographic characteristics of the studied geriatric patients

Items	N=61	%
Age		
• Young old (60 to less than 75 years)	52	85.2
• Middle old (75 to less than 85 years)	9	14.8
Mean ± SD (Min-Max)= 67.869±4.863(60-78)		
Sex		
• Male	40	65.6
• Female	21	34.4
Marital status		
• Married	50	82
• Unmarried*	11	18
Educational level		
• Illiterate	5	8.2
• Read and write	15	24.6
• Primary & Secondary education	34	55.7
• University	7	11.5
Residence		
• Urban	45	73.8
• Rural	16	26.2
Living condition		
• With Family	56	91.8
• Alone	5	8.2
Income		
• Not enough	47	77
• Enough	14	23

*Unmarried means= Single, Widow or Divorced

Table 2: Health-related history of the studied geriatric patients

Items	N=61	%
Health history		
Causes of chronic renal failure		
• Hypertension	46	75.4
• Diabetes Mellitus	10	16.4
• Drugs	5	8.2
Onset of disease		
• From 1 to 5years	46	75.4
• More than 5 years	15	24.6
Family history		
• Positive	35	57.4
• Negative	26	42.6
Presence of comorbidities		
• One disease	42	68.9
• Two or more disease	15	24.6
• No	4	6.6
Number of dialysis sessions per week		
• Two	7	11.5
• Three	54	88.5
Onset of starting hemodialysis		
• Less than 5 years	46	75.4
• From 5 years to 10 years	6	9.8
• More than 10 years	9	14.8
Duration of hemodialysis session		
• Three hours	6	9.8
• Four hours	52	85.2
• Five years	3	4.9



Post 1 means one month after application of Jacobson's progressive muscle relaxation
Post 2 means two month after application of Jacobson's progressive muscle relaxation

Figure (1): Level of fatigue of geriatric patients before and after application of Jacobson's progressive muscle relaxation

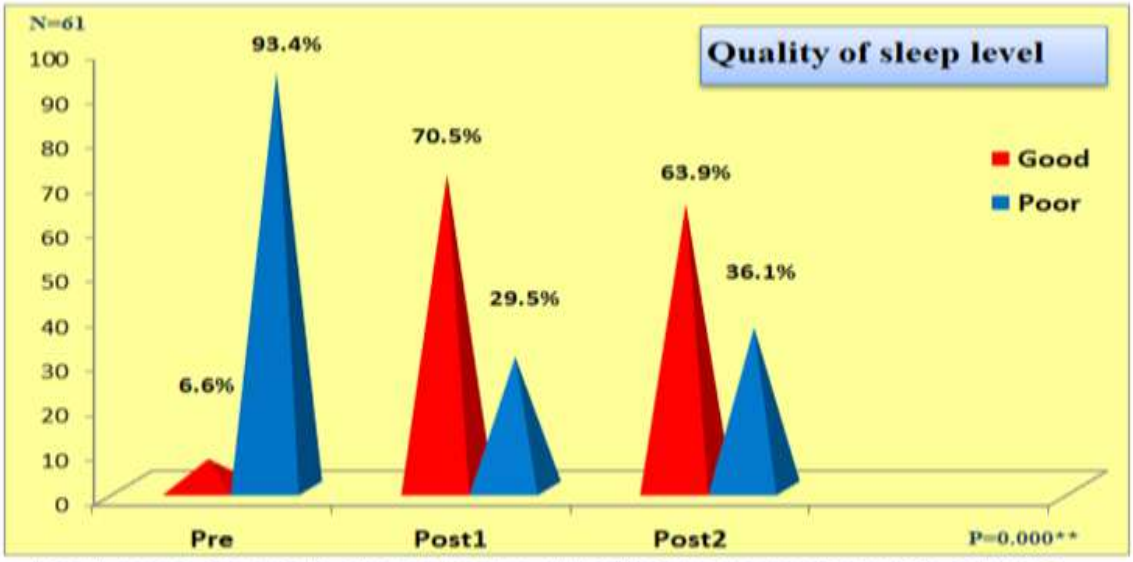


Figure (2): Sleep Quality of the studied Geriatric Patients Before and After Application Jacobson's Progressive Muscle Relaxation

Table (3): Effectiveness of Jacobson's progressive muscle relaxation on fatigue and sleep quality over 3 Time Periods.

Items	Pre	Post 1	Post 2	Test of significance	
		Mean ± SD		P1	P2
PSQI subscales					
- Subjective sleep quality	1.934±0.793	0.721±0.839	0.833±0.994	10.568 (0.000) **	8.421 (0.000) **
- Sleep latency	2.163±0.799	0.786±0.914	0.850±1.005	13.822 (0.000) **	12.139 (0.000) **
- Sleep duration	2.245±0.869	0.721±0.858	1.082±1.069	13.717 (0.000) **	10.126 (0.000) **
- Sleep efficiency	2.327±0.810	0.770±0.920	0.983±1.040	13.187 (0.000) **	10.700 (0.000) **
- Sleep disturbances	2.344±0.873	0.770±0.901	0.950±1.023	13.343 (0.000) **	10.492 (0.000) **
- Use of sleeping medication	2.163±0.916	0.754±0.887	0.934±1.062	11.743 (0.000) **	8.719 (0.000) **
- Daytime dysfunction	2.016±1.008	0.655±0.910	0.836±1.035	9.200 (0.000) **	8.137 (0.000) **
Total PSQI Score	15.15±4.22	5.18±5.69	6.26±6.09	t=18.116 (0.000) **	t= 16.236 (0.000) **
Total mean score of fatigue	83.03±11.52	33.31±9.53	34.08±10.12	t=46.336 (0.000) **	t= 43.755 (0.000) **

t-test with paired samples (p) 1: comparing pre and 1 month after the program (post1).
t-test with paired samples (p) 2: comparing pre and 2 months after the program (post2).

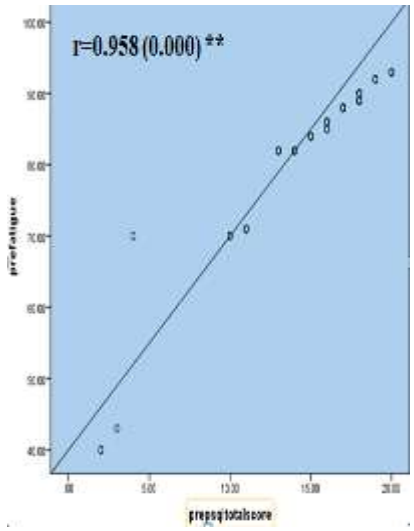


Figure (3): Correlation between fatigue and Pittsburgh sleep quality index before application of Jacobson's progressive muscle relaxation

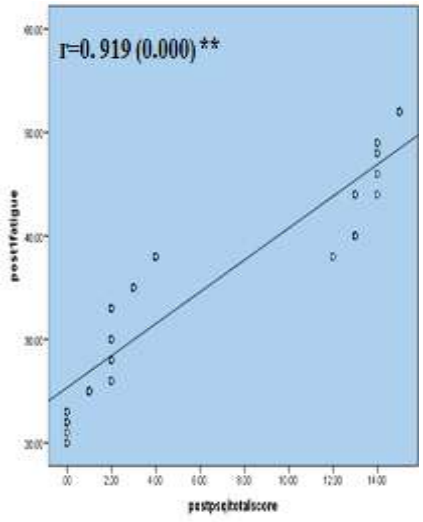


Figure (4): Correlation between fatigue and Pittsburgh sleep quality index after 1month from application of Jacobson's progressive muscle relaxation

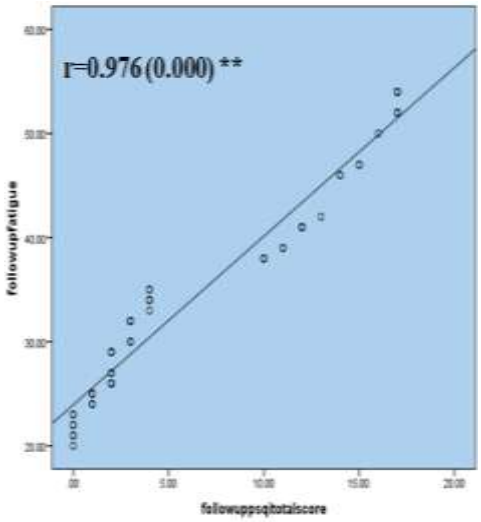


Figure (4): Correlation between fatigue and Pittsburgh sleep quality index after 1month from application of Jacobson's progressive muscle relaxation

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