

Effectiveness of Eye Movement Exercise Application on Pain and Stress among Patients undergoing Hemodialysis

¹Heba Gomaa Eldawoody Ali, ²Fatma A. Salem, ³Heba Kedees Marzouk, ⁴Kamal Mohamed Okasha, ⁵Badr Ibrahim Ahmed Abdou Abd El Rahman

1 Lecturer of Medical-Surgical Nursing, Faculty of Nursing, Sohag University, Egypt.

2 Assist. Prof. of Medical-Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

3 Assistant Professor of Psychiatric Mental Health Nursing, Faculty of Nursing, Assiut University

4 Prof. of Internal Medicine and Nephrology and Past Vice president for Postgraduate Studies and Research, Faculty of Medicine, Tanta university

5 Fellow Medical-Surgical Nursing, University Student Hospital, Mansoura University, Egypt

Abstract

Background: Stress and pain are high among patients undergoing hemodialysis. Extra calcium and phosphate can also settle in the eyes and cause eye pain and irritation in dialysis patients. Eye movement exercise application affected a wide range of physical and psychological signs and symptoms among patients undergoing hemodialysis. **Aim:** To evaluate the effectiveness of eye movement exercise application on eye pain and stress among patients undergoing hemodialysis **Subjects and methods Design:** Quasi-experimental research design pre-post-test was utilized in this study. **Settings:** The study was conducted at hemodialysis units at Sohag University Hospital, Egypt. **Sample:** Purposive samples of 100 patients undergoing hemodialysis were enrolled in this study. **Tools:** Three tools were used for data collection; Tool I: Structured Interview Questionnaire that contains two parts part one; patients' personal demographic data and part two; medical data history, Tool II: Short Form McGill Pain Scale (SF-MPS) to assess eye pain, and Tool III: Perceived Stress Scale (PSS-10). **Results:** The current study results revealed that; post-eye movement exercise application was significantly affected in reducing eye pain and stress mean scores among patients undergoing hemodialysis compared to pre-application. **Conclusion:** The study concluded that; the eye movement exercise application has a significant positive effect on reducing eye pain and stress among patients undergoing hemodialysis. **Recommendations:** The eye movement exercise should be integrated into the care of patients undergoing hemodialysis to help in the reduction of eye pain and stress reduction especially when they had fluids and electrolyte disturbances. Eye movement training should be promoted in practice because it can reduce negative emotions and alleviate pain sensations.

Keywords: Eye movement exercise, Eye Pain, Patients undergoing hemodialysis, Stress

Introduction:

At 2% to 3% of the world's population, end-stage renal disease (ESRD) is a clinical illness characterized by the kidneys' inability to carry out metabolic processes and preserve the body's fluid and electrolyte balance. According to **Dehbashi et al. (2019)**, hemodialysis is now the most popular alternate treatment for those individuals. Many physical and psychological indicators symptoms, including eye pain and stress, are experienced by patients receiving hemodialysis (**Sousa et al., 2020**).

According to **Mazouq et al. (2021)** pain is a very common complaint in hemodialysis patients. Roughly 75% of hemodialysis patients said their pain was not adequately controlled (**Jhamb et al., 2020**). According to **Sadikov et al. (2020)**, about 75% of patients receiving hemodialysis reported having persistent pain. According to **Dreihner et al. (2021)** 50.5% of patients receiving hemodialysis reported having significant pain. According to **Dos Santos et al. (2021)** the lower and upper extremities were the most commonly reported pain areas by patients receiving hemodialysis. Patients on hemodialysis had a significant

prevalence of pain, according to a comprehensive study; the estimated prevalence for acute pain was 60% and for chronic pain, 48% (**Lambourg et al., 2021**).

Eye Pain is one of the most prevalent health problems, and it is regarded to be the body's most important defense mechanism when it occurs under abnormal physiological conditions. Common eye problems for people with kidney disease or who are on dialysis; dry, red, and sore eyes that feel gritty. These symptoms may occur because of impaired blinking and tear formation, leading to dry eyes. Extra calcium and phosphate can also settle in the eyes and cause pain and irritation (**Otaghiet al., 2019**).

Hypotension from excessive fluid evacuation during hemodialysis and electrolyte imbalances is the main cause of muscle cramps. Similar to this, ischemia brought on by central catheter use during hemodialysis might result in excruciating neuropathies. There were several ocular problems such as macular edema, vitreous hemorrhage, proliferative diabetic retinopathy, optic atrophy, corneal and

conjunctival calcification, cataract, and hypertensive retinopathy (**García-Martínez et al., 2021**).

Patients on long-term hemodialysis may have rheumatic symptoms due to Dialysis-Related Amyloidosis (DRA). Common articular symptoms associated with DRA include effusion in big joints, carpal tunnel syndrome, spondyloarthropathy, and cystic bone lesions, all of which are often associated with non-inflammatory processes due to electrolyte disturbances in patients with hemodialysis. Because of the difficulty of assessing pain, several age-specific pain treatment instruments and ratings have been created. Also, although eye pain has some long-term negative consequences, alleviating pain and suffering is a critical responsibility of nurses caring for these patients (**García-Martínez et al., 2021**).

According to **Senmar et al. (2020)**, patients receiving hemodialysis also frequently experience stress. According to **Chape et al. (2018)**, hemodialysis patients face a variety of physiological and psychological stressors, including fatigue, venous and arterial sticks, hospital transportation, recurrent hospital stays, and the length of time they spend on dialysis. These limits on psychological and physiological functioning raise the perception of stress (**Behjat et al., 2020**). In 100 hemodialysis patients, extreme stress was experienced by 27% and severe stress by 56% (**Joseph et al., 2019**). According to **Senmar et al. (2020)**, 77.3% of patients receiving hemodialysis reported having severe to extremely severe stress. 37.5% of the patients receiving hemodialysis reported significant perceived stress, with the group's mean PS being 24.6 ± 9.4 (**Zibaei et al., 2020**).

Seeing Anxiety and pain are linked to all psychological variables and raise the likelihood of various mental illnesses in various patients. By lowering body resistance, they can biologically alter immune system function and put a person at risk for any kind of physical or mental illness. Unfortunately, hemodialysis patients are becoming more likely to experience anxiety, which can have a negative impact on their physical and mental health as well as cause problems with their treatment plan (**Sadeghifar & Mehrabian, 2019**). Stress can therefore impair immunity and increase a person's susceptibility to illnesses like coronavirus since people are anxious about the future and may not be familiar with the condition (**Zakeri et al., 2021**).

Even with the increased level of P&S among Patients undergoing hemodialysis, many have shown an interest in using non-pharmacological interventions" (**Zins et al., 2018**). A deep relaxation that includes the parasympathetic nervous system, reduces a person's physiological and emotional responses to stress.

WHO's stress management guide is to equip people with practical skills to cope with stress. A few minutes each day is enough to practice the guide's self-help techniques. The guide can be used alone or with its accompanying audio exercises (**WHO 2023**). This WHO stress management guide's sixth domain' includes; keeping a daily routine

schedule as setting time for regular meals, and time for family members' daily chores. The second domain is getting enough sleep and good sleeping habits known as sleep hygiene. Third, keep in touch with family and friends. The fourth domain is eating healthy food. The fifth domain includes exercise regularly as walking and the sixth includes limited time following news. Therefore, it is a useful non-pharmacological intervention for pain & Stress (**Zinset et al., 2018**).

Teaching is one of a nurse's primary responsibilities, and it becomes even more crucial while providing hemodialysis patients with nursing care to assist them manage their anxiety. Patients require psychotherapy, particularly if they are experiencing fluid and electrolyte disturbances from hemodialysis. This is done to help patients make decisions on their own, based on reliable information from the nurses and to enhance their comprehension of the causes of their problems, contributing factors, and available treatment options. The nurse does not propose or advise but rather offers help and nursing measures related to the efficacy of electrolyte disturbances on eye and neural activity if needed (**Lee et al., 2020**). Physical activity has been shown to have various positive effects on HD patients (**Sheng et al., 2014**). Exercise is also crucial for retaining physical independence (**Scapini et al., 2019**). Some of the important benefits linked to exercise include an improvement in physical fitness, aerobic capacity, dialysis adequacy (measured as urea Kt/V), quality of life, and reduced depressive symptoms (**Kang et al., 2017**).

Eye movement exercise is one of the non-pharmacological methods used to improve, and decrease the presence, and severity of pain and insomnia (**Hu et al., 2021; Sadeghi et al., 2020**). Exercises involving eye movements such as tracking visual stimuli in predetermined patterns can activate brain regions related to pain perception and sleep regulation. It can improve physical and sleep quality, lessen painful sensations, and lessen unpleasant emotions. Additionally, and can also raise living standards generally and productivity (**Hu et al., 2022**).

Significance of the study:

Patients with chronic illnesses have been found to experience stress at significant rates (**Zakeri et al., 2021**). Patients undergoing hemodialysis confront other stressors apart from their chronic illness, such as treatment-related issues, dietary and hydration limitations, weakness, anxiety, and depression (**Shinde & Mane, 2018**). Chronic kidney failure is one of the diseases that accompanies a person for a long period of his life, which affects the patient's emotional, cognitive state, his psychological and social adjustment. Thus it is reflected on his general health, as he is unable to perform his/her usual roles as he/she should. Treating the patient without considering these circumstances is considered ignoring basic factors that affect the deterioration of the patient's health. Hemodialysis also can cause

disturbances in cognitive functions and emotional disturbances.

A significant amount of researches has demonstrated the intriguing connection between pain, stress, and non-pharmacological interventions (Şara et al., 2022). One of the non-pharmacological interventions that was easy, safe, readily available, inexpensive, and suitable for autonomous use at any time or place is eye movement exercise. Furthermore, it has no negative effects and doesn't require any equipment to be used (Hu et al., 2021; Hu et al., 2022). From this standpoint, the research team began this study to identify how to evaluate the effectiveness of eye movement exercise application on Eye pain and stress among patients undergoing hemodialysis.

Aim of the study

The study aimed to evaluate the effectiveness of eye movement exercise application on Eye pain and stress among patients undergoing hemodialysis.

Research hypothesis:

H1; There will be a statistically significant difference in the pain mean score for eye pain pre and post-one months of receiving eye movement exercise application among patients undergoing hemodialysis.

H2; There will be a statistically significant difference and reduction in the stress mean score for eye pain pre and post-one month of receiving eye movement exercise application including stress management guide according to WHO 2023 among patients undergoing hemodialysis.

Operational definitions

Eye movement exercises: In the current study, the ability of the patient to carry out basic eye exercises, like moving the eyes downward and internal (using the inferior rectus), upward and internal (using the medial rectus), downward and internal (using the superior rectus), upward and external (using the inferior oblique), downward and external.

Subjects and Methods:

Research design:

Quasi-experimental research design pre-post-test was utilized to achieve the aim of this study.

Settings:

The study was conducted at hemodialysis units at Sohag University Hospital, Egypt

Sample:

A purposive sample of 100 patients undergoing hemodialysis was enrolled in this study.

Calculation of Sample Size:

Epi info -7 program was used utilizing the further parameters. Population size=100, Acceptable error= 5%, Confidence coefficient=95 %, Expected frequency=50%.

Inclusion criteria:

Adult conscious patients aged from 18 years to 60 years old from both sexes, free from physical, mental, and other chronic disease, Patients free of mental illness history, free from cognitive disease, willing to engage in communication and participation in the study, and not having received any prior instruction in eye movement exercises.

Exclusion criteria: were patients having a mental disease and refusing to participate in this study. In addition to exclusion of any ocular complications from those patients undergoing hemodialysis.

Data collection tools:

Three tools were used to collect the data for the study as the following:

Tool I: Structured Interview Questionnaire to identify data related to the patient's personal and medical history (pre and post-test format) was created by the researchers following an assessment of relevant papers and literature. It was divided into the next two sections:

Part (1): Patient's Demographic Characteristics:

This covered data such as age, sex, education, and residence.

Part (2): Patient's Medical History Assessment

involved the duration of treatment with hemodialysis (yr.) hemodialysis sessions number per week, type of vascular access, and sources of information.

Tool II: Short Form McGill Pain Scale (SF-MPS).

Developed by [redacted] and adopted. The SF-MPQ assesses the Pain Rating Index (PRI), which is made up of four affective, eleven sensory, and fifteen descriptive adjectives that are rated on a four-point scale (0 = none, 1 = mild, 2 = moderate, and 3 = severe), producing three scores. 12 to 15 are the affective dimensions, and 1 to 11 are the sensory dimensions. The total score is the sum of the two scores indicated above for the sensory and affective domains. The sensory and affective domains are computed by adding the values of the individual items separately. For participants who speak Arabic, the SF-MPQ Arabic version's results showed that it is valid and dependable (Bhoi et al., 2017).

Tool III: Perceived Stress Scale (PSS-10).

It was developed by [redacted] and used as it is. A 5-point Likert scale with 10 items (0 = never, 1 = seldom, 2 = sometimes, 3 = pretty often, and 4 = very often) is used to measure PS in the PSS-10. Positive statements on four items (4,5, 7, and 8) have been rated in reverse order (0 = very often, 1 = pretty often, 2 = sometimes, 3 = rarely, and 4 = never). The overall score is calculated as the sum of the 10 components. Low points range from 0 to 13, moderate points from 14 to 26, and high points range from 27 to 40. When PSS-10 in Arabic was employed, its internal consistency score was 0.86 (Hattar & Dawani, 2006).

Tools Validity:

The content validity of the tools, their clarity, comprehensiveness, appropriateness, and relevance

were reviewed by five expert professors; two experts in Medical-Surgical Nursing, one expert in Mental Health Nursing, and two expert physicians from the nephrology Department. Modifications were made according to the panel judgment to ensure sentence clarity, comprehensiveness, and content appropriateness.

Pilot study:

This was conducted on 10% of the total sample size (10 patients undergoing hemodialysis) to ensure the applicability of the tool and the time needed to complete it. No change was made. The patients undergoing hemodialysis who participated in the pilot study were included in the main study sample.

Tools reliability:

The instruments utilized to assess consistency and dependability were as follows: tool II study's SF-MPQ reliability has an excellent internal consistency ($\alpha = .83$). and tool III study's PSS-10 dependability has an excellent internal consistency ($\alpha = .86$).

Ethical considerations:

Official approval was obtained from the Research Ethics Committee at the Faculty of Nursing, Sohag University before the study began. Official permission was obtained through an issued letter from the Dean of the Faculty of Nursing, Sohag University and should first explain the purpose of the study and get consent for data collection. Following an explanation of the goals and design of the study, informed consent was obtained from each patient who took part. Patients were also given instructions on how to complete the tools. The option to leave at any moment or to decline to respond to a question without providing an explanation was granted to them. Data about subjects is kept confidential and anonymous by the researcher.

Procedure:

The fieldwork was conducted from the beginning of October 2023 to the end of December 2023, during which time it was closed. Phases of assessing, planning, carrying out, the study were all completed.

Preparation Phase:

The first month of October 2023 to the first day of November 2023 was the period of preparation. Creating the organized tools and the exercise based on the analysis of relevant material were part of it. Booklets, pictures, movies, and PowerPoint presentations were used to portray it. It was written in basic Arabic and included pictures and graphics.

Implementation Phase:

Beginning in November 2023 and ending in December 2023 was the implementation phase. The aim of

the study, its anticipated results, and the contents of the instruments were explained to the patients in typical duration

The studied patients received eye movement exercises using video and written flyers following these steps. (1) The researchers explained to the participants the function of eye movement training. (2) kept the participants in a quiet and relaxed condition, with both eyes into the distance horizontally during which the eyeballs were moved internal (with medial rectus), upwards/internal (with superior rectus), downwards/internal (with inferior rectus), upwards/external (with inferior oblique), and downwards/ external (with superior oblique) for 36 times each and moved annular from left to right to the maximum extent, this session took about 15-30 minutes. After that, the researchers asked the participants to demonstrate the exercise to check the accuracy of the application of eye movement exercise that was performed once a day for two weeks before bedtime.

Relaxation technique was done for stress management guide and was given to correct diet efficacy and reduce stress such as progressive muscle relaxation, deep breathing exercises, guided imagery, visualization, book reading, prayer, and therapeutic touch.

Evaluation phase:

The effectiveness of eye movement application (exercise and stress management guide including relaxation technique) on eye pain and stress among patients undergoing hemodialysis was reevaluated post one month using the same pre-test tools.

Limitation of the study:

This study was done according to purposive sample that are not randomized so that it cannot be generalized over all hemodialysis patients.

Statistical analysis:

Version 25 of the Statistical Package for the Social Sciences (SPSS-v25) was used to analyze the data. To provide percentages means, and standard deviations for the patients' medical and demographic data, descriptive statistics were performed. The independent t-test and chi-square test were used. The study employed the independent t-test to assess any variations in pain and stress. At p -value < 0.05 , the statistical significance criterion was reached.

Results:

Table 1 portrays that 60% of the patients in the study were over 40 years old, 60% of them were male, 58% of them were enrolled in secondary education, and 75% of them were urban residents.

Table 2 shows that 66% of the patients employed fistula as a method of vascular access treatment, and 29% of the analyzed patients had been receiving hemodialysis for at least four years. Of these, 88% had three times a week hemodialysis sessions.

Nurses and doctors made up 60% and 40% of the patients' primary sources of information on hemodialysis, respectively, as shown in **Figure 1**.

Table 3: Presents evidence of significant improvements and reductions between pre and post-patients' eye pain mean scores regarding hemodialysis after eye movement exercise application p-value ($P < 0.001^*$).

Figure 2: Indicates that there were significant improvements between pre and post-total patients' pain levels regarding hemodialysis after eye movement exercise application p-value ($P < 0.001^*$).

Table 4: Indicates that there was a significant reduction in pre and post-patients' stress mean scores regarding hemodialysis after eye movement exercise application p-value ($P < 0.001^*$).

Figure 3: Indicates that there was a significant lower between pre and post-total patients' stress levels regarding hemodialysis after eye movement exercise application p-value ($P < 0.001^*$).

Table (1): The studied patients demographic distribution concerning their characteristics (n=100)

Personal Characteristics	No	%
Age:		
<40	38	38.0
> 40	62	62.0
Sex		
Female	40	40.0
Male	60	60.0
Education:		
Primary education	18	18.0
Secondary education	58	58.0
High education	24	24.0
Residence:		
Urban	75	75.0
Rural	25	25.0

Table (2): The studied patient's distribution concerning their medical history (n=100)

Patient's medical history	No	%
Duration of treatment with hemodialysis (yr.)		
≤1	24	24.0
2	21	21.0
3	26	26.0
≥4	29	29.0
Hemodialysis sessions number per week		
Three	88	88.0
Other	12	12.0
Type of vascular access		
Fistula	66	66.0
Catheter	34	34.0

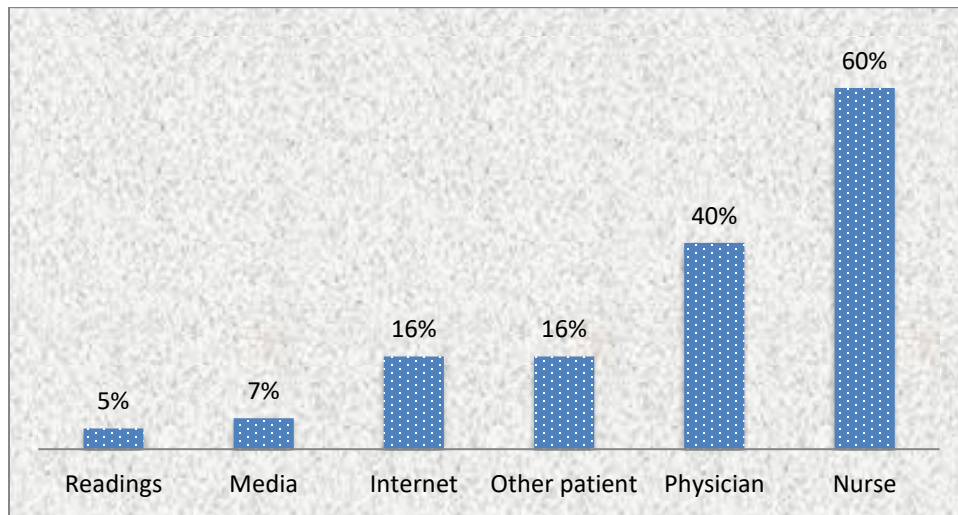


Figure (1): Source of knowledge about hemodialysis among the studied patients (n=100)

Table (3): Comparison between Short Form McGill Pain Scale (SF-MPS) eye pain mean score among the studied patient's pre and one month post-eye movement exercise application

Items	Pre-eye movement exercise application		Post- eye movement exercise application		X2	p-value
	No	%	No	%		
Eye Pain Mean Score (SF-MPS)	30.61 (2.74)		23.50 (2.52)		0.833	0.001*

**Highly Significant at 0.001 levels

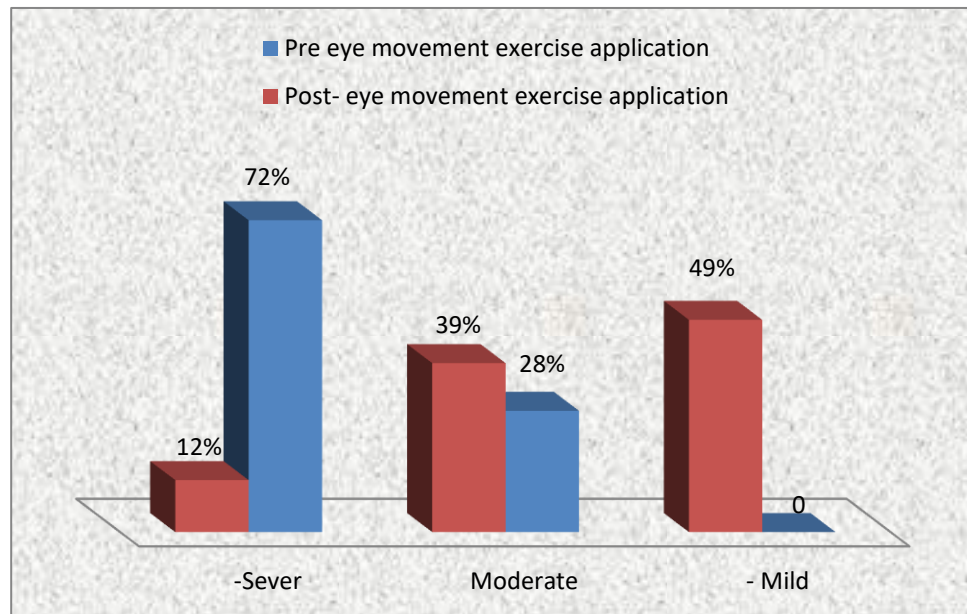


Figure (2) : Total patients' pain levels regarding hemodialysis after eye movement exercise application

Table (4): Comparison between Perceived Stress Scale (PSS-10) stress mean score among the studied patient's pre and one month post-eye movement exercise application

Items	Pre-eye movement exercise application		Post- eye movement exercise application		X2	p-value
	No	%	No	%		
Stress mean score(SF-MPS)	30.33 (2.87)		23.50 (2.49)		0.853	0.001*

**Highly Significant at 0.001 levels

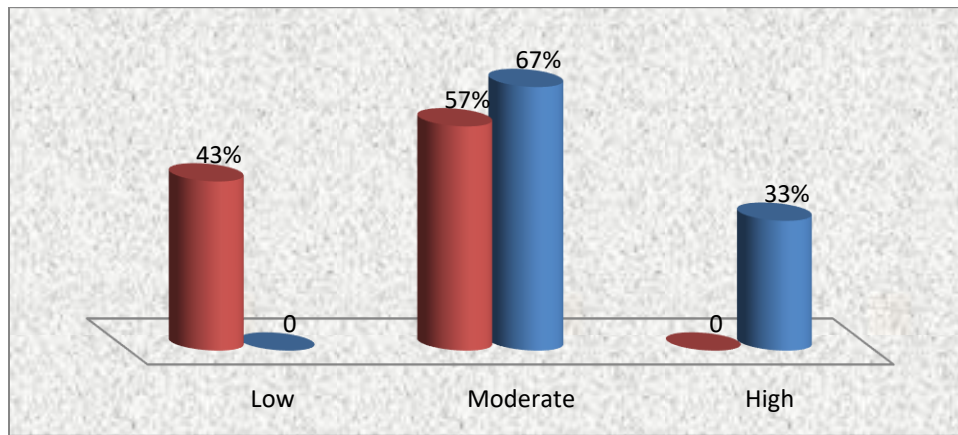


Figure (2) : Total patients' stress levels regarding hemodialysis after eye movement exercise application

Discussion:

The current study hypothesized that patients' eye pain and stress regarding hemodialysis will be improved after receiving eye movement exercise application. Additionally, patients undergoing hemodialysis will have to reduce their pain and stress levels after receiving eye movement exercise application. Hence, the study aimed to identify the effectiveness of eye movement exercise application on eye pain and stress among patients undergoing hemodialysis.

Based on the available data, men made up three out of every five patients. A study about "Frequency of CMV-infection among hemodialysis patients:" conducted at Tikrit Teaching Hospital by **Saadoon, (2019)** & **Abdel-Kader et al., (2019)** revealed that males accounted for more than two-thirds of the patients, in comparison to other studies. An additional source of evidence was discovered by **Kang et al. (2019)**, who discovered that over half of the sample in their study "Nutritional status predicts 10-year mortality in patients with end-stage renal disease on hemodialysis" was male. According to **Fatim et al. (2018)**, over half of the patients are from the age range of 48 to over 48 years old. This is consistent with our findings.

It might be explained by the disparities in lifestyles between the sexes (more men smoke and use alcohol, for example). The results of a study by **Abdel-Kader et al. (2019)** titled "Individual quality of life in chronic kidney disease: Influence of age and dialysis modality" suggest that a poor lifestyle may potentially worsen renal failure. According to the research, there are more men than women suffering from end-stage renal disease (ESRD).

In terms of medical history, the current study's findings indicated that most of the patients under investigation underwent hemodialysis three times a week; these findings are consistent with those of **Parlak & Sahin (2021)**, who also found that nearly all patients undergo hemodialysis three times a week. This outcome is consistent with the findings of **Dehghan et al. (2021)** and **Fatim et al. (2018)**. According to the experts, this could be the reason why the patients under study were in pain and stressed out.

According to the current study's findings, nurses and doctors were the primary sources of information for three-

fifths of patients and two-fifths of patients, respectively, regarding hemodialysis were other resources. According to the researchers, this finding indicates that patients wanted to ask medical professionals for information.

Concerning patients' eye pain mean scores, the findings of the current study revealed that there were significant improvements and reductions between pre and post-patients' pain mean scores regarding hemodialysis after eye movement exercise application p-value. From the researchers' point of view, this result reflects the positive effect of eye movement exercise application, which meets the studied patients' needs and helps in pain reduction.

The present findings revealed that there were significant improvements between pre and one month post-total patients' pain levels regarding hemodialysis after eye movement exercise application. From the researchers' point of view, it reflected the positive effect of eye movement exercise application and illustrated the importance of introducing eye movement exercise application for patients undergoing hemodialysis. This result coincides with **Walsh, (2022)**; **Rahimi et al., (2023)** who clarified eye movement exercise application was effective in pain alleviation. From the researchers' point of view, eye movement exercise is one of the relaxation techniques in yoga, which enhances relaxation, especially with repetition.

The present findings revealed that there was a significant reduction in pre and post-patient stress means scores regarding hemodialysis after eye movement exercise application and stress management guide according to **WHO (2023)**. These results explained the disease condition, caused increasing emotional disturbance levels, fear of the unknown, and reflected the success of the eye movement exercise application which focused on helping patients to relieve their stress. This finding goes in the same line with **Hu et al., (2021)**; **Jurado-Fasoli et al., (2020)** while after two weeks, there was a statistically significant difference in stress. Similarly, this finding correspondent to **Kizilgz, Yeildal, and Kabalak, (2019)** who found the same results.

The findings of the present study displayed that there was a significant lower between pre and one month post-total patients' stress levels regarding hemodialysis after eye movement exercise application including stress management guide according to WHO 2023. It was the researchers' opinion that the results validated the established research hypothesis and demonstrated how well patients' stress levels could be reduced by using eye movement exercises. This finding matches with **Hu et al., (2021); and Hu et al., (2022)** who reported that their participants obtained significantly lower stress levels after eye movement exercise.

Conclusion:

Based on the results of the present study, the study findings concluded that the results support the research hypothesis that eye movement exercise application achieved significant improvements and reduction in the patient's eye pain and has a positive effect on lowering their stress levels that were undergoing hemodialysis.

Recommendations:

Based on the current study results, the following recommendations are proposed:

- The **eye movement exercise** should be integrated into the care of **patients undergoing hemodialysis** to help with reduction of eye pain and stress reduction.
- Eye movement training should be promoted in practice because it can reduce negative emotions and alleviate pain sensations.
- It is advised that patients receiving hemodialysis have access to ongoing educational sessions.
- It is recommended that patients receiving hemodialysis receive psychological therapy in order to help them cope with and develop greater resilience to hemodialysis.
- If the current study is to be repeated, a bigger patient sample and a randomized sample of patients receiving hemodialysis in various settings are necessary for generalizing the findings.

References:

- Abdel-Kader, K., Myaskovsky, L., Karpov, I., Shah, J., Hess, R., Dew, M. A., & Unruh, M. (2019).** Individual quality of life in chronic kidney disease: Influence of age and dialysis modality. *Clinical Journal of the American Society of Nephrology*, 4(4), 711–718.
- Behjat, A., Mirshamsi, Z., Karbalaee Saleh, S., & DashtBozorgi, Z. (2020).** The effectiveness of the rehabilitation program of Dohsa- hou on perceived stress, meta-worry, and quality of life of hemodialysis patients. *Iranian Journal of Rehabilitation Research in Nursing*, 7(1), 44–54. <https://doi.org/10.29252/ijrn.7.1.44>.
- Bhoi, D., Ranjitha, N., Talawar, P., & Narasimhan, P. (2017).** Development and validation of the Arabic version of the short-form McGill Pain questionnaire. *Saudi Journal of Anesthesia*, 12(3), 637–639. <https://doi.org/10.4103/sja.SJA>
- Dehbashi F, Sabzevari S, Targari B. (2019).** The relationship between spiritual well-being and hope in hemodialysis patients referring to the Khatam Anbiya hospital in Zahedan 2013-2014. *Med Ethics J*; 9:77-97. [persian].
- Dehghan, M, Namjoo, Z, Mohammadi Akbarabadi, F, Fooladi, Z, & Zakeri, M A (2021).** The relationship between anxiety, stress, spiritual health, and mindfulness among patients undergoing hemodialysis: A survey in Southeast Iran. *Health Science Reports*, 4(4), e461.
- Dos Santos, P. R., Mendonça, C. R., Hernandes, J. C., Borges, C. C., Barbosa, M. A., Romeiro, A. M. S., Alves, P. M., Dias, N. T., & Porto, C. C. (2021).** Pain in patients with a chronic kidney disease undergoing hemodialysis: A systematic review. *Pain Management Nursing*, 22(5), 605–615. <https://doi.org/10.1016/j.pmn.2021.05.009>
- Dreier, J., Fleishman, T. T., & Shvartzman, P. (2021).** Pain management evaluation in maintenance hemodialysis patients. *Pain Medicine*, 22(9), 1946–1953. <https://doi.org/10.1093/pm/pnaa488>
- Fatim J. Shinjar1 , Serwan J. Bakey1 , Khalida M Khudur1. (2018).** Effectiveness of an Education Program on Hemodialysis Patients, Knowledge towards Dietary Regimen at Al-Hussein Teaching Hospital in Al- Al-Nasiriya City, *Indian Journal of Public Health Research & Development*, October, Vol. 9, No. 10
- García-Martínez, P., Ballester-Arnal, R., Gandhi-Morar, K., Castro-Calvo, J., Gea-Caballero, V., Juárez-Vela, R., Saus-Ortega, C.,Montejano-Lozoya, R., Sosa-Palanca, E. M., Gómez- Hattar, M., & Dawani, H. (2006).** Cognitive appraisal of stress and health status of wage working and nonwage working women in Jordan. *Journal of Transcultural Nursing*, 17(4), 349–356. <https://doi.org/10.1177/1043659606291543>
- Hu, H., Yang, W., Liu, Z., Zhang, X., Shi, J., & Xu, H. (2021).** Effect of Eye Movement Training on Stress and Sleep Quality of Patients with Advanced Lung Cancer Based on Pittsburgh Sleep Quality Index. *Journal of Healthcare Engineering*, 2021.
- Hu, H., Zhang, X., Chen, L., Liu, R., Liu, T., Li, S., & Xu, H. (2022).** Effect of Conventional Nursing Combined with Bedtime Oculomotor Training on Stress, Sleep Quality and Body Immunity of Advanced Lung Cancer Patients. *Journal of Healthcare Engineering*, 2022.
- Jhamb, M., Tucker, L., & Liebschutz, J. (2020).** When ESKD complicates the management of pain. *Seminars in Dialysis*, 33(3), 286–296. <https://doi.org/10.1111/sdi.12881>
- Joseph, N., Thomas, A., Philip, A. S., George, D., George, G., & George, J. K. (2019).** A study to assess the level of stress regarding hemodialysis among chronic renal failure patients in a selected hospital at Ernakulam, Kerala, India. *International Journal of Research and Review*, 4(11), 23–26.
- Jurado-Fasoli, L., De-la-O, A., Molina-Hidalgo, C., Migueles, J. H., Castillo, M. J., & Amaro-Gahete, F. J. (2020).** Exercise training improves stress and sleep quality: A randomized controlled trial. *European Journal of clinical investigation*, 50(3), e13202.
- Kang SS, Chang JW, Park Y. (2017).** Nutritional status predicts 10-year mortality in patients with end-stage renal disease on hemodialysis. *Nutrients*; 9(4): 399.
- Kang, S.H., Do, J.Y., Jeong, H.Y., Lee, S.-Y., Kim, J.C. (2017).** The clinical significance of physical activity in maintenance dialysis patients. *Kidney Blood Press. Res.* 2017, 42, 575–586.

- Kizilgz, H. Yeildal, D. & Kabalak, A. (2019).** Effect of eye movement training on stress and sleep quality of patients with advanced lung cancer, *Eurasian Journal of Pulmonology*, vol. 21, no. 2, p. 93.
- Lambourg, E., Colvin, L., Guthrie, G., Murugan, K., Lim, M., Walker, H., Boon, G., & Bell, S. (2021).** The prevalence of pain among patients with chronic kidney disease using systematic review and meta-analysis. *Kidney International*, 100(3), 636–649. <https://doi.org/10.1016/j.kint.2021.03.041>
- Lee, J. Steel, M.-E. Roumelioti, S. Erickson, L. Myaskovsky, J.G. Yabes, A. (2020).** Psychosocial impact pandemic on patients with end-stage kidney disease on hemodialysis, *Kidney* 1 (2) 1390–1397, <https://doi.org/10.34067/kid.0004662020>, 360.
- Marzouq, M. K., Samoudi, A. F., Samara, A., Zyoud, S. H., & Al-Jabi, S. W. (2021).** Exploring factors associated with pain in hemodialysis patients: A multicenter cross-sectional study from Palestine. *BMC Nephrology*, 22(1), 96. <https://doi.org/10.1186/s12882-021-02305-1>
- Otaghi, M., Borji, M., Bastami, S., & Solymanian, L. (2016).** The effect of Benson's relaxation on depression, anxiety, and stress in patients undergoing hemodialysis. *International Journal of Medical Research & Health Sciences*, 5(12), 76–83.
- Parlak, A. G., & Şahin, Z. A. (2021).** The Effect of Covid 19 Fear on Quality of Life in Hemodialysis Patients: A Correlation Study in Turkey. *Samsun Sağlık Bilimleri Dergisi*, 6(2), 367-382.
- Rahimi, M. D., Hassani, P., Kheirkhah, M. T., & Fadardi, J. S. (2023).** Effectiveness of eye movement exercise and diaphragmatic breathing with jogging in reducing migraine symptoms: A preliminary, randomized comparison trial. *Brain and Behavior*, 13(1), e2820.
- Romero, M. D. R., & Collado-Boira, E. (2021).** Perceived stress about quality of life and resilience in patients with advanced chronic kidney disease undergoing hemodialysis. *International Journal of Environmental Research and Public Health*, 18(2), 536. <https://doi.org/10.3390/ijerph18020536>
- Saadoon IH. (2017).** Frequency of CMV-infection among hemodialysis patients in Tikrit City. *Iraqi Journal of Science*; 56(3C): 2523-2528.
- Sadeghi, N., Azizi, A., Asgari, S., & Mohammadi, Y. (2020).** The effect of inhalation aromatherapy with damask rose essence on pain intensity and anxiety in burned patients: A single-blind randomized clinical trial. *Burns*, 46(8), 1933-1941.
- Sadeghifar J, Mehrabian T. (2019).** Prediction of depression, anxiety, and stress based on spiritual components in patients on hemodialysis. *Iran J Psychiatr Nurs*;4:45-51. doi:10.21859/ijpn-04057. [persian].
- Sadigova, E., Ozkurt, S., & Yalcin, A. (2020).** Pain assessment in hemodialysis patients. *Cureus*, 12(2), e6903. <https://doi.org/10.7759/cureus.6903>
- Şara, Y., Örsal, Ö., Duru, P., & Köşgeroğlu, N. (2022).** Evaluation of Preoperative Sleep Quality and Factors Affecting Pain Intensity of Patients Hospitalized in Surgical Services. *Journal of PeriAnesthesia Nursing*.
- Senmar, M., Razaghpoor, A., Mousavi, A. S., Zarrinkolah, F., Esmaili, F., & Rafiei, H. (2020).** Psychological symptoms in patients on dialysis and their relationship with spiritual well-being. *Florence Nightingale Journal of Nursing*, 28(3), 243–249. <https://doi.org/10.5152/fnjin.2020.19061>
- Sheng, K., Zhang, P., Chen, L., Cheng, J., Wu, C., Chen, J. (2014).** Intradialytic exercise in hemodialysis patients: A systematic review and meta-analysis. *Am. J. Nephrol.*, 40, 478–490.
- Scapini, K.B., Bohlke, M., Moraes, O.A., Rodrigues, C.G., Inácio, J.F., Sbruzzi, G., Leguisamo, C.P., Sanches, I.C., Tourinho Filho, H., Irigoyen, M.C. (2019).** Combined training is the most effective training modality to improve aerobic capacity and blood pressure control in people requiring hemodialysis for end-stage renal disease: Systematic review and network meta-analysis. *J. Physiother*, 65, 4–15.
- Sousa, L., Valentim, O., Marques-Vieira, C., Antunes, A. V., Severino, S., & Jose, H. (2020).** Association between stress/ anxiety, depression, pain and quality of life in people with chronic kidney disease. *Revista de Enfermagem de Saude Mental*, 23, 47–53. <https://doi.org/10.19131/rpesm.0272>
- Tchape, O. D. M., Tchapoga, Y. B., Atuhaire, C., Priebe, G., & Cumber, S. N. (2018).** Physiological and psychosocial stressors among hemodialysis patients in the Buea Regional Hospital, Cameroon. *Pan African Medical Journal*, 30, 49. <https://doi.org/10.11604/pamj.2018.30.49.15180>
- Walsh, J. (2022).** eye movement desensitization and reprocessing: standard versus pain-focused treatment protocols.
- World Health Organization. (2023).** Stress management guide according to WHO 2023.
- Zakeri MA, Dehghan M, Ghaedi-Heidari F, Zakeri M, Bazmandegan G. (2021).** Chronic patients' activation and its association with stress, anxiety, depression, and quality of life: a survey in Southeast Iran. *Biomed Res Int*; 2021:6614566. doi:10.1155/2021/6614566
- Zibaei, M., Nobahar, M., & Ghorbani, R. (2020).** Association of stress and anxiety with self-care in hemodialysis patients. *Journal of Renal Injury Prevention*, 9(2), e14. <https://doi.org/10.34172/jrip.2020.14>.
- Zins, S., Gross, C. R., & Hooke, M. C. (2018).** Complementary therapies for pain among individuals receiving hemodialysis: A systematic review. *Nephrology Nursing Journal*, 45(1), 13–23.