Effectiveness of Eye Movement Exercise Application on Pain and Anxiety among Children undergoing Haemodialysis

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Abstract

Children with chronic kidney disease undergoing hemodialysis therapy experience various physical and mental problems that contribute to psychological disorders such as pain and anxiety. It can affect the mental and physical components of poor quality of life. Pain and anxiety among children on dialysis is an important issue to be discussed, in addition to how eye movement exercise application can help in making this through the pediatric nurse. **Hence, this study aimed to** evaluate the effectiveness of eye movement exercise application on pain and anxiety among children undergoing hemodialysis**. Research design:** A quasi-experimental research design was used to achieve the aim of the current study. **Setting:** The study was conducted in the Pediatric Nephrology Unit at Sohag University Hospital. **Sample:** A purposive sample that included all 100 children on dialysis was selected. **Tools:** three tools were used: Tool (I) included children's personal data, and medical record sheets of the studied children, Tool (II) included the Numeric Pain Rating Scale, and Tool (III) included the Hamilton Anxiety Rating Scale. **Results:** A highly statistically significant difference and reduction were found regarding the total mean scores of pain and anxiety among children undergoing hemodialysis, where the children had low total mean scores of pain and anxiety levels after receiving eye movement exercise, compared to post-eye movement exercise application**. Conclusion:** It can be concluded that eye movement exercise application had a positive effect in reducing pain and anxiety among children undergoing hemodialysis. **Recommendation:** eye movement exercise application, It is suggested to be incorporated into the daily nursing practice for the management of psychological problems in children undergoing hemodialysis to reduce pain and anxiety.

Keywords: Anxiety, Children undergoing hemodialysis, Eye movement exercise application, Pain.

Introduction:

With or without a decline in glomerular filtration rate (GFR), chronic kidney disease (CKD) is defined as the presence of structural or functional kidney abnormalities, such as abnormal urine analysis, imaging investigations, or histology, that last for at least three months. A widespread issue around the world is end-stage renal failure (ESRF), which is a complete loss of kidney function. Around 18.5% to 58.3% of children globally suffer from chronic renal disease (**Gulati, 2020**). CKD may occasionally develop into end-stage renal disease (ESRD) **(Farrag et al., 2022).**

These include kidney damage, diabetes mellitus, hypertension, kidney artery stenosis, kidney diseases, restricted urine flow, systemic lupus erythematosus, fetal developmental issues, excessive use of certain medications, such as nonsteroidal anti-inflammatory drugs (NSAIDs), kidney artery stenosis, and specific toxins **(Gilbert et al., 2022).** Hereditary or congenital diseases are the most common causes of chronic kidney disease (CKD) in children, ranging in age from infancy to early adolescence. Gumulonephritis is the most common cause of chronic kidney disease

(CKD) in people aged 15 to 19. According to **Ghatas et al. (2020**), chronic kidney disease also causes a host of other health issues, including anemia, heart problems, bone loss, and death.

The most popular procedure for treating renal failure is hemodialysis (HD), which purges the blood of extra fluid and waste. The child's blood is extracted by the hemodialysis machine using a central venous catheter (CVC) inserted into a major blood vessel or an arteriovenous fistula (AVF) or graft that has been surgically constructed (AVG). Waste materials and extra water are eliminated from the blood as it travels through a dialyzer or artificial kidney (**Marcdante et al., 2022**). Despite not being a cure, HD reduces a number of the severe and occasionally fatal side effects of CKD. Children with HD are more likely than the general population to be hospitalized, which leads to several additional issues such as anemia, CKD, mineral bone disease, vascular access-related complications, and hypertension **(Yahia et al., 2022).**

Children receiving hemodialysis frequently experience pain from intravenous infusions. In addition to experiencing discomfort during venipuncture, many kids also have anxiety before dialysis, which can intensify their pain perception and make the procedure unpleasant. Nurses who care for children have a significant responsibility to alleviate pain and suffering because it can have several negative long-term effects (**Kennedy et al, 2018**).

The emergence of pain under abnormal physiological conditions is considered to be the body's most important defense mechanism, and it is one of the most prevalent health issues in children. Numerous age-specific pain treatment tools and ratings have been created due to the challenges of evaluating pain in children (**Srouji & Ratnapalan, 2021**). When eye pain arises under aberrant physiological settings, it is considered the body's most significant defense system and is one of the most common health issues. People with kidney illness or dialysis frequently have dry, red, and painful, gritty eyes. Dry eyes can result from these symptoms, which can be caused by impaired blinking and tear production. Additional phosphate and calcium may accumulate and settle in the eyes and cause pain and irritation **(Otaghiet al., 2019).**

The various lifestyle changes that children undergoing hemodialysis must make are an emotional burden. Stress and anxiety are the most common psychological problems in children receiving hemodialysis, and they are linked to several conditions that hurt health outcomes, such as survival and quality of life (**George et al., 2022**).

In children, chronic renal failure is a significant risk factor for the development of mental health conditions like anxiety. Both genetic and psychosocial factors can cause anxiety, which can result from being ill, hospitalized, undergoing operations, being in a risky environment, or being poorly. These variables can also cause metabolic issues and developmental delays. Anxiety can worsen illnesses by affecting nutritional conditions, reducing immune function, and upsetting the neurological and cardiac systems. The compliance of the youngster may also be affected (**Lopes, 2020**).

Anxiety is also believed to affect a child's ability to manage symptoms, take their medications as prescribed, and have positive medical outcomes. Children who experience anxiety should be identified early and treated appropriately since it is thought to be one of the most important aspects of health-related quality of life (**Gandhi et al, 2018**). Information on anxiety's prevalence in children with chronic kidney disease (CKD) undergoing dialysis was inconsistent, despite the fact that anxiety is becoming more and more significant in somatic disorders **(Bakr et al, 2019).**

Recognizing Pain and anxiety are related to every psychological factor and increase the risk of different mental diseases in different patients. They have the potential to biologically change immune system function and increase an individual's susceptibility to physical or mental illnesses by reducing body resistance. Hemodialysis patients are regrettably increasingly prone to suffer from anxiety, which can negatively impact their physical and mental well-being and interfere with their treatment regimen

(**Sadeghifar & Mehrabian, 2019**). According to **Zakeri et al. (2021**), anxiety can weaken immunity and make a person more vulnerable to diseases like coronavirus because people are worried about the future and might not be aware of the situation. Despite the higher levels of pain and anxiety experienced by kids receiving hemodialysis, several have demonstrated 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 anxiety **(Aljuaid et al., 2020).**

Non-pharmacological approaches are crucial for managing children's chronic kidney disease because they not only stop the disease from progressing to end-stage renal disease but also help them meet their physiological and emotional demands while maintaining the highest possible quality of life. Additionally, therapy needs to preserve typical development and growth (**Sajid et al, 2018).**

One of the non-pharmacological strategies for reducing the incidence and intensity of pain and sleeplessness is eye movement exercise (EME) **(Hu et al., 2021; Sadeghi et al., 2020).** Brain areas linked to pain perception and sleep regulation can be activated by eye movement exercises, such as following visual stimuli in preset patterns. It can reduce unpleasant emotions, minimize painful sensations, and enhance physical and sleep quality. Furthermore, it can increase productivity and overall living standards **(Hu et al., 2022).** This work could significantly contribute to the growing corpus of research on non-pharmacological treatments for pain relief. Eye movement exercises are a readily available and reasonably priced tool that nurses can use to improve patients' health. According to **Aljuaid et al. (2020**), nurses are vital members of the healthcare team who help patients overcome their worries by implementing evidence-based treatments.

According to the American Psychiatric Association, eye movement exercises are a low-cost, safe, and noninvasive treatment for cancer patients, heart disease patients, and earthquake survivors. According to **Marofi et al. (2019**), the World Health Organization has approved eye movement exercises as a therapeutic intervention for the treatment of anxiety. As a fundamental premise of eye movement exercise treatment, anxiety is the result of upsetting experiences that the nervous system has not adequately processed, which can result in isolated neurobiological stagnation (**Shapiro & Maxfield, 2022**).

Eye movement exercises, which are based on the adaptive information processing (AIP) concept, were first created to alleviate pain and anxiety. They are behavioral-cognitive exercises. Anxiety and sadness are two long-term detrimental effects of stressful situations. To process and resolve any such underlying unprocessed events that could have detrimental mental effects, EMDR is used. **Cuijpers and Lee (2023**)The parasympathetic nervous system is instantly activated and physiological reactions result from the guided eye movements utilized with dialysis patients (**Benor et al., 2019**). While the mind is focused on difficult life challenges, this involves alternating the left-right brain simulation using eye movements, sounds, or taps to stimulate the frozen or stopped information processing system (**Shapiro, 2024).**

For children receiving dialysis, pediatric nurses are expected to play a significant part in their care and to take on the dual duties of therapeutic management and health education. Additionally, nurses should have specialized training and exercise, new therapeutic language, technical skills, and compound daily practices for long-term illness supervision. At the same time, they should treat children's concerns about their well-being, pain, uncertainties about the future, and the risks and dangers of transplantation while maintaining their regular functions **(Wightman and others, 2019).**

According to **Eskandari et al. (2019),** pediatric nurses have concentrated on advocating for natural approaches to child care that are less uncomfortable and painless. Although pharmacological pain management techniques can have negative effects on children, alternative modalities have gained popularity as a way to overcome these

drawbacks **(Gray & Draibe, 2019** & **Miquelutti et al, 2018).**

Finding the necessary care for children receiving hemodialysis is the primary duty of pediatric nurses, who are the primary healthcare professionals who care for children. According to **Bayoumi (2018),** pediatric nurses are the primary providers of care and work closely with the sick child. To promote their health, children receiving hemodialysis should get health education and training. Furthermore, there is a pressing need to increase their consciousness. Consequently, this research will furnish sufficient data regarding the best ways to alleviate discomfort and anxiety in adolescents with chronic renal failure receiving hemodialysis (**Hassona, 2019**).

Significance of the study:

End-stage renal disease (ESRD) is predicted to affect 74 million people annually in Egypt, whereas the overall number of children receiving dialysis is 264 million. According to **Al-Shammari (2021**), the prevalence of chronic renal failure among pediatric hemodialysis patients is approximately 15 per million annually. Because of the severity of the issues with pediatric pain and anxiety, research has also concentrated on developing preventive measures that stop symptoms from getting worse. As crucial as treating pediatric anxiety and discomfort is preventing it in the clinical child and adolescent setting. Research indicates that short-term, non-pharmacological therapies can help avoid anxiety in children. Pain symptom levels can be significantly decreased through treatment and preventative initiatives **(Stoll & Pina, 2019).**

As a result, nurses have the largest influence over the health outcomes of children receiving hemodialysis. To lessen the need for emergency hemodialysis sessions, for example, nurses can teach children to modify their behaviors and lifestyle. Additionally, nurses must prevent additional psychological issues brought on by the underlying illness and provide hemodialysis patients with mental health support (**McCabe, 2024**). Hemodialysis center nurses might employ eye movement desensitization and reprocessing (EMDR) treatment as one of the nonpharmacological therapeutic methods in this regard.27. According to **Abbasnejad et al. (2020)**, it should be integrated into routine nursing practice to address psychosocial issues in children with chronic illnesses.

Eye Movement Exercise is a non-pharmacological intervention that is easy, safe, readily available, inexpensive, and suitable for autonomous use at any time or place. Furthermore, it has no negative effects and does not require any equipment to be used **(Hu et al., 2021).** The previous research indicated that poor psychological status of hemodialysis children could deteriorate the overall health of hemodialysis children which can affect the children's function in the future (**Abbas et al, 2019)**. Hence, the researcher found that is urgent to conduct this study to evaluate the effectiveness of eye movement exercise application on pain and anxiety among children 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.

Aim of the study

To evaluate the effectiveness of eye movement exercise application on pain and anxiety among children undergoing hemodialysis through:

- Assessing pain level among children undergoing hemodialysis
- Assessing anxiety level among children undergoing hemodialysis
- Implement non-pharmacological strategies among children on dialysis to mitigate pain and anxiety.
- Determining the effectiveness of eye movement exercise application on pain and anxiety among children undergoing

hemodialysis.

Research hypothesis:

H1: There will be a statistically significant difference in the mean score for pain intensity between post-application and pre-eye movement exercise application two weeks of application.

H2: There will be a statistically significant difference in the mean score for anxiety between post-application and pre-application one week and one month of receiving eye movement exercise application

Subjects and Method:

Research design:

A quasi-experimental research design pre-post-test was used to achieve the aim of the current study.

Setting:

The study was conducted in the Pediatric Nephrology Unit at Sohag University Hospital,

Sample:

Sample: A purposive sample that included all 100 children on hemodialysis was selected.

Inclusion criteria included:

Children with chronic renal failure and undergoing hemodialysis who visited the previously mentioned settings, children of both sexes aged from 8-18 years old and who agree to participate in the study or consent is obtained from caregivers, willing to engage in communication, and not having received any prior instruction in eye movement exercises.

Exclusion criteria included:

Children who are suffering from mental disorders or other chronic diseases have undergone similar interventions and refuse to participate in the 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%.

Tools of data collection:

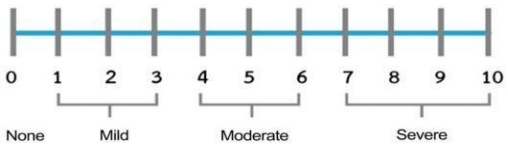
Data were collected using the following two tools as following:

Tool (I):- Children's data and medical record sheets of the studied children undergoing hemodialysis were created by the researchers after they reviewed relevant material; it was written in Arabic and divided into two sections, which comprise:

Part 1 (10 items): Children's personal data (4 items): age, gender, educational level, and residence.

Part 2 (7 items): Children's medical record sheets: Included data about the medical history of studied children as Duration of the disease, Duration of hemodialysis, Number of sessions per week, Duration of the hemodialysis session, family history, previous hospitalization, and types of vascular access.

Tool (II): Numeric Pain Rating Scale (NRS) adopted from Farrar et al, (2008), used to measure the child's level of pain, asking them to select the number on the segmented scale that best represents their level of suffering. The scale has 11 points, with 0 denoting "no pain" and 10 denoting "unbearable pain." It was utilized twice by researchers in one-on-one interviews before and after manipulation.



Scoring system:

Numeric Pain Rating Scale (NRS): The child is given an 11-point rating scale, with 0 denoting "no pain" and 10 denoting "unbearable pain." Scores range from 1 to 3 for mild pain, 4 to 6 for moderate pain, and 7 to 10 for severe pain. The child is asked to select the number on the segmentation scale that best represents the level of their suffering.

Tool (III): Hamilton Anxiety Rating Scale (HAM-A)

Assessing the degree to which the patient exhibits the specified criterion is the evaluator's task. Every item receives a separate score according to its point and ratio system. A child with a rating of 0 does not exhibit the emotion. A patient who receives a rating of 1 has a mild prevalence of the emotion. A score of two means that the patient has a considerable prevalence of the emotion. When a patient has a rating of 3, it means that the feeling is quite prevalent. When a patient has a rating of 4, it means that the feeling is extremely prevalent.

When using the Hamilton Anxiety Rating Scale, the acting therapist goes over the fourteen items, assessing each criterion separately using the previously mentioned five-point scale. Multiple-choice questions were written on a page, and each child was questioned separately. Each child was allowed to select one response based on their level of fear for each topic. This method was performed twice, before and after manipulation. It should take ten to fifteen minutes to administer and is used to gauge the intensity of anxiety symptoms. The 14-item scale, which is characterized by a number of symptoms, assesses somatic anxiety (physical complaints associated with anxiety) as well as psychic anxiety (mental agitation and psychological discomfort).

Scoring system:

Hamilton Anxiety Rating Scale (HAM-A) **:**

After the evaluation is finished, the clinician adds up all 14 of the individually assessed elements to create a composite whole score. The comprehensive score obtained from this computation will fall between 0 and 56. It has been decided that the evaluation's findings can be interpreted in the following ways. A score of 17 or lower denotes a mild level of anxiety. A score between 18 and 24 denotes mild to moderate levels of anxiety. Finally, moderate to severe anxiety is indicated by a score between 25 and 30.

Validity of the tools:

Three pediatric nursing specialists were shown the tools by the researchers to ensure their validity. They did not need any of the products to be altered.

Reliability of the tools:

• The tool's reliability was assessed using the Alpha Cronbach's test in SPSS V.20, and the result was 0.84.

• According to a reliability study, the interclass correlation coefficient for the Numerical Rating Scale (NRS) was 0.83 ($P < 0.001$) (Farrar et al, 2008).

• The Hamilton Anxiety Rating Scale (HAM-A) has demonstrated construct validity among children and strong test-retest ($rs = 0.76$, $p<0.001$) and inter-rater ($rs = 0.51$, $p<0.001$) reliability (Hamilton, 1959).

A pilot study:

10% of the study sample, or 10 children receiving hemodialysis, participated in the pilot study. This was done to make sure the measures were clear, applicable, and took the required amount of time. The children who participated in the pilot study were included in the study.

Administrative and ethical considerations:

The study started after receiving formal approval from the Sohag University Faculty of Nursing's Research Ethics Committee. The Nephrology unit of the Pediatric Medical Department at Sohag University Hospital's relevant authorities formally granted authorization to perform the study in the previously chosen location. To the children and their parents who were present in the hemodialysis unit, the researchers explained the purpose and design of the study. Additionally, participants received information about their involvement in the study, the likelihood that they could leave at any time, and assurances regarding the privacy of their data. Additionally, each child's and parent's oral consent was sought to secure compliance.

Fieldwork:

The researchers used scientific books, journals, periodicals, and the internet to better understand the issue, create the study measures, and finalize them after reviewing the most recent local and international related literature. The pediatric members in the aforementioned situations were introduced to the researchers. To get their assistance, the researchers gave them an explanation of the study's nature and goal. The study's

assessment, implementation, and evaluation phases were employed by the researchers.

Preparation Phase:

The actual fieldwork was carried out from the beginning of January 2023 to the end of April 2023 at the Pediatric Hemodialysis Unit at Sohag University Hospital in Egypt. Creating the organized tools and the exercise based on the analysis of relevant material was 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.

Assessment Phase:

- Prior to beginning this investigation, administrative approval was obtained from the relevant authorities. Permission was also acquired from the Sohag Faculty of Nursing Deans.
- The children's names and numbers were extracted from the hospital's hemodialysis unit's medical records, and they were attempted to be grouped by their assessed inclusion criteria, age, and gender.
- The researchers gathered baseline information. Describe the purpose of the study to the physicians and nurses employed in the aforementioned environment. After describing the goal of the study and providing a thorough description of each tool, the researchers also conducted individual interviews with each kid, introduced themselves, and obtained oral consent. Using the previously employed instruments, the researchers evaluated children's pain and anxiety while also gathering demographic information.
- To see as many children as possible, the researchers were able to collect data three days a week from 8:00 a.m. to 1:00 p.m. and occasionally from 2:00 p.m. to 7:00 p.m., as hemodialysis lasted between four and five hours. This stage was finished in about ten minutes.
- Pretest: The researchers used the Numeric Rating Scale to record the pain score (tool II) based on the child's selection of the number that corresponded to the level of pain experienced during the insertion of the dialysis needle.
- Following that, the researchers asked each child 14 questions regarding their anxiety symptoms, including somatic (physical) and psychological distress. The Hamilton Anxiety Rating Scale to Cover Tool (III) was then used by the researcher to assign a score to each item; this process took roughly 15 to 20 minutes to complete.

Implementation phase:

The children were prepared by the researchers. Each child received an application of eye movement exercises, which were utilized to alleviate discomfort and anxiety before hemodialysis, in order to divert their focus during the placement of the needle.

> The children received the eye movement exercise application intervention during hemodialysis three times immediately, over 2 weeks within a total 4-week period.[41] It was carried out in a private and quiet room for 30 to 45 minutes in each session by the primary investigator.

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. 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.

Evaluation phase:

The effectiveness of eye movement application on eye pain and anxiety among children undergoing hemodialysis was reevaluated post two weeks using the same pre-test tools.

Limitation of the study:

This study was done according to purposive samples that are not randomized so that it can not be generalized overall hemodialysis children

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): Clarified that 67% of the studied children were in the age group 11 <18 years with Mean ± SD 9.23 ±1 .78, and 56% of them were female. Also, 68% of them were living in rural areas. Considering educational level, 62% of them were in primary school. As well as 45% were ranked as second children in their families.

Table (2): Represented that 39 % of the studied children had renal failure between < 3 years, and 55% of them were undergoing hemodialysis between 3 < 6 years, 37% of them had three hemodialysis sessions per week. Also, in 55% of the studied children, their hemodialysis session duration was 4 hours. Also, the same table shows that 75% of children were previously hospitalized and 80% of them didn't have a family history of renal disorders. Half of the studied children had the only fistula as a vascular access for dialysis and the other half had both fistula and venous catheter.

Table (3) portrays that there was a highly significant difference between pain means scores on (NRS) among the studied children pre and post-Eye movement exercise application on the numeric rating scale (NRS).

Figure (1), illustrates an improvement and reduction in total pain levels that 35% had severe pain in the Eye movement exercise application compared to no one who had severe pain post Eye movement exercise application.

Table (4) portrays that there was a highly significant difference between anxiety means scores among the studied children pre and post-eye movement exercise application.

Figure (2), illustrates that there was a significant improvement and reduction in total anxiety levels 35% had severe anxiety in Eye movement exercise application compared to no one had severe pain post Eye movement exercise application.

Table (5): Proved that there is a statistically significant relation between children's total level of pain and their gender, residence, and number of hemodialysis sessions per week. There is no statistically significant relation between children's total level of pain and their age, level of education, birth order, and duration of the disease and hemodialysis.

Table (6): Illustrates that there is a statistically significant relation between children's total level of anxiety and their gender.

Table (7): Indicated that there is a highly statistically significant correlation between children's total level of pain and their total level of anxiety. There is a statistically significant correlation between children's total level of anxiety and their Eye movement exercise application.

Table (1): Personal data among the studied children (n=100)

Items	No	%
Age		
8 - <12 years	33	33
11 - <18 years	**67**	**67**
Mean± SD	**9.23 ±1 .78**	
Gender		
Male	44	44
Female	**56**	**56**
Residence		
Rural	**68**	**68**
Urban	32	32
Child's Education Level		
Illiterate	20	20
Primary school	**62**	**62**
Secondary school	18	18
Ranking		
First	20	20
Second	**45**	**45**
Third	28	28
Fourth	7	7

Table (2): Medical history among the studied children(n=100)

items	Frequency	Percent
Duration of the disease		
Less than a year	**18**	**18**
1 < 3 years	**39**	**39**
3 < 6 years	**16**	**16**
≥ 6 years	**27**	**27**
Duration of hemodialysis:		
Less than a year	**5**	**5**
1 < 3 years	**38**	**38**
3 < 6 years	**55**	**55**
≥ 6 years	**2.0**	**2.0**
Number of sessions per week:		
One session	**33**	**33**
Two sessions	**30.0**	**30.0**
3 sessions	**37**	**37**
Duration of the hemodialysis session:		
2 hours	**22**	**22**
3 hours	**23**	**23**
4 hours	**55**	**55**
More than 4 hours	**0.0**	**0.0**
Family history of renal disorders		
Negative	**75**	**75**
Positive	25	25
Previous hospitalization		
Yes	20	20
No	**80**	**80**
Types of vascular access		
Fistula	50	50
Fistula and venous catheter	50	50

Table 3: Differences in pain means scores on (NRS) among the studied children pre and post Eye movement exercise application

Pain level	Pre	Post	p-value
Total Pain Mean Scores	7.2 ± 1.9	3.04 ± 2.77	0.001*

P>0.05, statistically insignificant difference
P<0.001, a very highly statistically significant difference

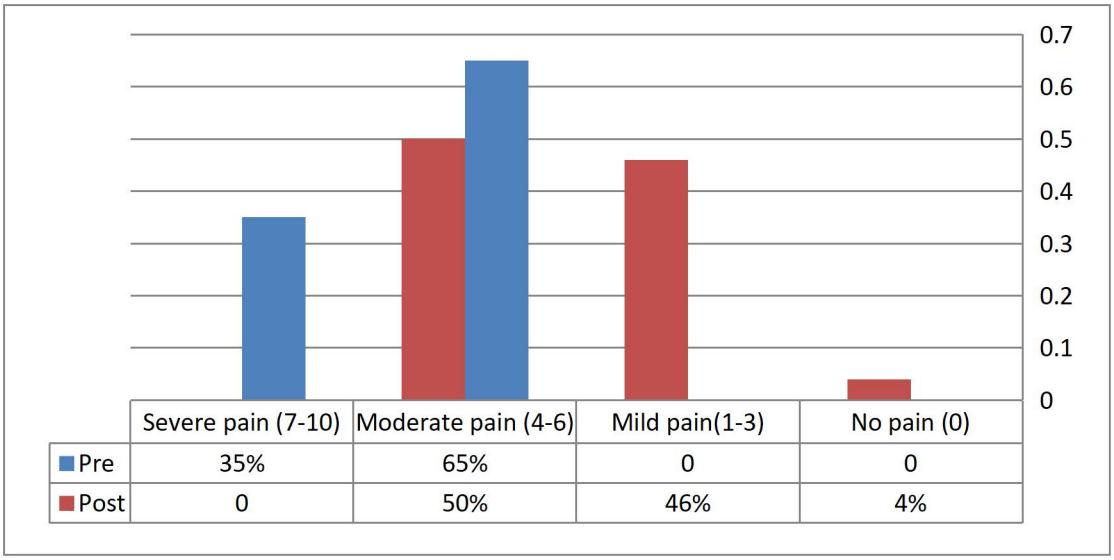


Figure (1): Total pain levels on Numeric Rating Scale (NRS) **among the studied children pre and post Eye movement exercise application**

Table 4: Differences in anxiety means scores among the studied children pre and post-movement exercise application

Anxiety level	Pre	Post	p-value
Total Anxiety Mean Scores	26.2±3.7	19.1±2.4	0.001*

P<0.001, a very highly statistically significant difference

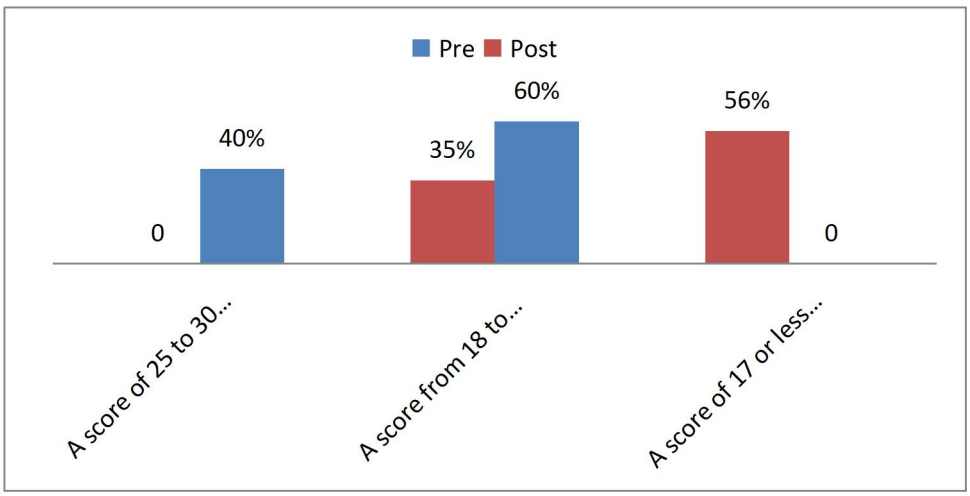


Figure (2): Total anxiety levels among the studied children pre and post-movement exercise application

Table (5): The relationship between children's pain level related to their personal data and medical history.

Personal data and medical history		Total pain level
Personal		**P value**
Age	Pearson Correlation	-.068
	Sig. (2-tailed)	.592
Level of child's education	Pearson Correlation	-.059
	Sig. (2-tailed)	.642
Duration of the disease	Pearson Correlation	.083
	Sig. (2-tailed)	.522
Gender	Pearson Correlation	.204
	Sig. (2-tailed)	**.095(*)**
Residence	Pearson Correlation	-.261
	Sig. (2-tailed)	**.027(*)**
Ranking	Pearson Correlation	-.078
	Sig. (2-tailed)	.535
Duration of hemodialysis	Pearson Correlation	-.032
	Sig. (2-tailed)	.81s
Number of sessions per week	Pearson Correlation	.216
	Sig. (2-tailed)	**.082(*)**
Duration of	Pearson Correlation	-.064
The hemodialysissession	Sig. (2-tailed)	.618

** Correlation is significant at the 0.01 level (2-tailed)

Table (6): The relationship between children's anxiety levels related to their Personal data and medical history

Personal data and medical history		Total anxietylevel
		P value
Age	Pearson Correlation	-.077
	Sig. (2-tailed)	.533
Level of child'seducation	Pearson Correlation	.054
	Sig. (2-tailed)	.685
Duration of thedisease	Pearson Correlation	.063
	Sig. (2-tailed)	.632
Gender	Pearson Correlation	.276
	Sig. (2-tailed)	**.026(*)**
Residence	Pearson Correlation	-.054
	Sig. (2-tailed)	.677
Birth order	Pearson Correlation	.093
	Sig. (2-tailed)	.462
Duration of hemodialysis	Pearson Correlation	.124
	Sig. (2-tailed)	.323
Number of sessions perweek	Pearson Correlation	.112
	Sig. (2-tailed)	.383
Duration of thehemodialysis session	Pearson Correlation	-.045
	Sig. (2-tailed)	.719

** Correlation is significant at the 0.01 level (2-tailed).

Table (7): Correlation between Eye movement exercise application, pain, and anxiety among thestudied children undergoing hemodialysis

		Total pain	Total anxiety	**Eye movement exercise application**
Total pain	Pearson Correlation	1	**.458(**)**	.000
	Sig. (2-tailed)		.000	1.000
	N	66	65	60
Total anxiety	Pearson Correlation	**.458(**)**	1	**-.274(*)**
	Sig. (2-tailed)	.000		.036
	N	65	65	59
Eye movement exercise application	Pearson Correlation	.000	**-.274(*)**	1
	Sig. (2-tailed)	1.000	.036	
	N	60	59	60

** Correlation is significant at the 0.01 level (2-tailed).

Discussion:

The main goals of nursing care for children with chronic kidney disease are proactive management, early identification, and primary prevention. Pediatric nurses are essential in helping kids receiving hemodialysis feel less stressed and anxious. Through their provision of physical comfort, emotional support, education, and coping strategy facilitation, nurses help to improve these children's overall health. The best care for children receiving hemodialysis requires interdisciplinary cooperation and continual professional growth in pediatric nephrology (**Mardhiyah et al., 2022**). Therefore, this study's goal was to evaluate the effectiveness of eye movement exercise application on pain and anxiety among children undergoing hemodialysis

Approximately two-thirds of the children in the current study were between the ages of 11 and 18 years, with a mean ± standard deviation of 9.23 ±1.78. According to a study by **Ghatas et al. (2020**) in Zagazig, Egypt, titled "Psychosocial Status of Children under Hemodialysis and Their Quality of Life," over half of the children in the study were between the ages of 11 and under 15. This could be because, according to the study, children's renal systems have suffered from bad lifestyle choices and postponed treatment of pre-existing comorbidities.

According to the current study's findings, over half of them were female. This result is in line with that of (Abdelsamie et al., 2022), who carried out a study in Alexandria, Egypt titled "Effect of Acupressure on Thirst among Children Undergoing Hemodialysis," and discovered that over half of the children in the study were female. Alternatively, this result was disputed by Farrag et al. (2022), who carried out a study in Sohag, Egypt titled "Non-pharmacological Strategies to Mitigate Pain and Anxiety among Children on Dialysis," and discovered that over half of the children in the study were male. This might be because male and female hormone levels differ, which could affect kidney function, according to the researcher **(Guzel,2019)**.

According to the current study, over two-thirds of the children under study lived in rural areas. This result was consistent with the findings of a study by **Darwish et al. (2021**) in Assiut, Egypt, titled "Health-related quality of life in children with chronic kidney disease in Assiut, Egypt," which revealed that three-quarters of the children in the study came from rural areas. According to the researcher, this can be explained by several factors, including the fact that rural areas frequently have poor sanitation and hygiene, limited access to healthcare facilities, and environmental factors that are common there, like exposure to toxins, pollutants, and agricultural chemicals, which may raise the risk of kidney damage.

In terms of the children's educational attainment, the present study found that over

two-thirds of the children were enrolled in elementary school. In a study titled "Effect of Intradialytic Exercise on Fatigue, Psychological Distress, and Biochemical Findings among Hemodialysis Children," conducted in Menofia, Egypt, **Salama et al. (2022)** found that over half of the children in the study had only completed primary school. This finding was also consistent with that of **Mohammed et al. (2021**), who discovered that two-thirds of the children in their study had just completed elementary school. The study was named "Effect of Foot Reflexology on Hemodialysis School-Age Children on Fatigue and Sleep Quality" and was carried out in Minia, Egypt.

According to the current study's birth order of the children under study, almost half of them were classified as the second children in their homes. **Mokbel et al. (2022**) found that half of the children in their study were ranked as second children in their families. Their study, "Effect of Immersive Virtual Reality during Arteriovenous Fistula Puncture on Pain Intensity among Children Undergoing Hemodialysis in El Beheira Governorate," was conducted in El Beheira, Egypt.

As regards the duration of the disease, the current study revealed that less than two-fifths of studied children had renal failure from 1 up to 3 years. This finding was by **(Hasan et al., 2021)**, who conducted a study in Cairo, Egypt entitled (Neurophysiologic Study in Children with End Stage Renal Disease on Regular Pediatric Hemodialysis) mentioned that nearly half of the studied children had renal failure for less than 4 years. Furthermore, this finding was in agreement with **(Ali etal., 2023)**, who conducted a study in Minia, Egypt entitled (Empowerment Program for Mothers to Improve the Quality of Life of Their Children Undergoing Hemodialysis on Arteriovenous Fistula Care) which mentioned that nearly one-third of the studied children had a renal failure for less than 3 years.

These results are comparable to those of **Javalkar et al. (2019**), who examined 15 end-stage renal disease (ESRD) patients regularly receiving hemodialysis at Zagazig University Hospital between the ages of 5 and 14 (**Youssef et al, 2022**). According to the findings of the current study, the majority of children have been receiving hemodialysis for two years, meaning that they were impacted sometime between the ages of seven and nine or earlier. The average age at which CRF in children first appears and manifests itself is between five and eight years old (**Pankaj Hari et al, 2023).**

As regards the duration of hemodialysis, the current study revealed that more than half of the studied children were on regular hemodialysis for 3 to 6 years. This finding was in agreement with **(Elalfy et al., 2023)**, who conducted a study at Ain Shams, Egypt entitled (Iron status in chronic kidney disease pediatric patients on hemodialysis) and mentioned that more than two-thirds of studied children with dialysis duration of 3 to 6 years.

Also, the current study revealed that more than one-third of the studied children received 3 hemodialysis sessions per week; and more than half of them their hemodialysis session duration was 4 hours.This finding was in agreement with **(Fadel et al., 2022)** who conducted a study in Cario, Egypt which entitled (Cardiovascular Complications and Indoxyl Sulfate Are Related to Longer Duration of End Stage Renal Disease in Children) revealed that more than two-thirds of the studied children received hemodialysis on regular basis (3 sessions per week, 3-4 hours each session). Also, these findings are consistent with those of **Parlak & Şahin (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.

The current study's findings demonstrated that there was a highly significant difference between pain means scores among the studied children pre and post-eye movement exercise application on the numeric rating scale (NRS). From the researcher's point of view, this might be explained as the child's experience with hemodialysis may entail various physical

and psychological strains, exacerbated by the unpredictability of the body's response to treatment, painful fistula cannulation, the need for lifelong medication, social limitations, and the uncertainty of how the body will react to unforeseen stressors, this creates apprehension and pain. It also confirmed the success of Eye movement exercise application which helps in alleviating pain. Also, this result reflects the positive effect of eye movement exercise application, which meets the studied children's needs and helps in pain reduction.

The present findings revealed that there were significant improvements between pre and post-total children's 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 children 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 that enhances relaxation, especially with repetition.

These results explained the disease condition, caused increasing emotional disturbance levels and fear of the unknown, and reflected the success of the eye movement exercise application which focused on helping patients to relieve their pain. 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 corresponds to **Kizilgz, Yeildal, and Kabalak, (2019**) who found the same results.

The current study's findings demonstrated an improvement and reduction in total pain levels that 35% had severe pain in eye movement exercise application compared to no one had severe pain post Eye movement exercise application. This could be linked to the effectiveness of eye movement exercise applications in helping youngsters in pain control their pain and reducing their level of concentration when they receive hemodialysis. These results are consistent with a study by **Samaneh et al. (2019**) called "Effects of Distraction on Physiologic Indices and Pain Intensity in Children Aged 3-6 Receiving IV Injection," which discovered a significant difference in the mean pain scores on a numeric scale between the control and other groups. Similarly, in their investigation into the assessment of non-pharmacologic techniques of pain and anxiety management for laceration repair in pediatric emergency departments, **Sinha et al. (2019**) found that distraction helped lessen the pain and anxiety of stitching in children under the age of ten.

The current study's results were in line with those of **Alavi et al. (2018**), who investigated pediatric pain treatment provided by nurses at Shahrekord Educational Hospitals and discovered that using non-pharmacological methods during pain management can reduce children's suffering. According to a study done in Egypt by **Mohamed (2020**) to assess the impact of specific distractions on the level of pain and fear in 50 children undergoing painful procedures, less than ten percent of them saw severe pain during painful procedures in the posttest.

The current study indicated that there was a highly significant difference between anxiety means scores among the studied children pre and post-eye movement exercise application. From the researcher's point of view, it reflected the positive effects of eye movement exercise application. 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); Hu et al., (2021)** who reported that their participants obtained significantly lower anxiety levels after eye movement exercise.

Concerning the total level of anxiety of the studied children, the current study indicated that there was a significant improvement and reduction in total anxiety levels that a high percentage had severe anxiety in Eye movement exercise application compared to no one had severe pain post Eye movement exercise application. This finding was approved by **(Farrag et al., 2022)**, who

conducted a study at Sohag, Egypt entitled (Non- pharmacological Strategies to Mitigate Pain and Anxiety among Children on Dialysis) they found that more than three-quarters of studied children had severe anxiety. Also, this finding was in agreement with **(Elzakzouk et al., 2020)** who conducted a study in Benha, Egypt entitled (Psychological Assessment in Children with Chronic Kidney Disease on Regular Hemodialysis) which concluded that more than half of the studied children had severe anxiety. From the researcher's point of view, the increased level of anxiety may be explained by the specificity of HD therapy. The hemodialysis sessions in themselves are commonly associated with acute feelings of anxiety. Anxiety among hemodialyzed children was triggered when children heard an alarm and machine sound or when new staff connected the child to a dialysis machine. Also, increased fatigue, uremia, failure of family support restrictions in daily life, non-compliance to a therapeutic regimen including restrictions in diet and fluids, and dependency upon treatment and health professionals seem to trigger anxiety in hemodialyzed children.

The results of the current study proved that there is a statistically significant relation between children's total level of pain and their gender, residence, and number of hemodialysis sessions per week. This is by **(Elzakzouk et al., 2020)** who conducted a study at Benha, Egypt entitled (Psychological Assessment in Children with Chronic Kidney Disease on Regular Hemodialysis) and concluded that there were statistically. In the light of the present study findings, it can be concluded that most of the studied children had severe anxiety, and also that more than half of the studied children had a high pain level. Meanwhile, there was a statistically significant relation between children's total level of anxiety and their gender, residence, and number of hemodialysis sessions per week.

The results of the current study indicated that there is a highly statistically significant correlation between children's total level of pain and their total level of anxiety. This result aligns with the findings of **Afshar et al. (2018).**

The results of this study showed that children's overall anxiety levels and their use of eye movement exercises were positively correlated. According to the researchers, it could be connected to the children's anxiety brought on by having needles inserted and having to visit the hospital three times a week for therapy. Consequently, different, less expensive methods should be employed to counteract the children's unfavorable impressions of hemodialysis (**Dawood et al, 2021).**

Based on the current study's findings, there was a statistically significant relation between children's total level of anxiety and their gender, residence, and number of hemodialysis sessions. This finding is consistent with **(Salama et al., 2022**) who conducted a study in Menofia, Egypt entitled (Effect of Intradialytic Exercise on Fatigue, Psychological Distress, and Biochemical Findings among Hemodialysis Children) which demonstrated that there was a statistically significant relation between children the total level of stress and their gender.

This finding was in the same line with **(Nagar et al., 2021)** who conducted a study at Nadiad City, Gujarat entitled (Depression, Anxiety and Stress among the Patients of Chronic Kidney Disease at Nadiad City, A Cross-sectional Survey) and concluded that there was a statistically significant correlation between the studied children' total level of pain and their total level of anxiety. From the researcher's point of view, this finding has several explanations that may account for this observed association. For instance, untreated pain may lead to anxiety and may hurt interpersonal relationships, thus leading to failure in adapting to the demands of this chronic treatment.

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 had positive effects in reducing pain and anxiety among children 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 **children undergoing hemodialysis** to help with pain and stress reduction.
- Eye movement training should be promoted in practice because it can reduce negative emotions and alleviate pain sensations.
- Children undergoing hemodialysis should have access to continuing education programs, according to recommendations.
- It is recommended that **children** receiving hemodialysis receive psychological therapy to help them cope with and develop greater resilience to hemodialysis.
- Dialysis facilities should be equipped to meet the entertainment and enjoyment demands of kids in a way that is appropriate for their age. This will help them feel better psychologically and make dialysis more pleasant and pleasurable.
- Pediatric nephrologists, social workers, psychotherapists, and nurses must work together to undertake child rehabilitation sessions. Children benefit from these sessions by becoming more confident, accepting of themselves, and reintegrating into society.
- To generalize the results, the current study should be replicated on a larger Children undergoing hemodialysis in other settings are required.

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