

## Non-pharmacological Strategies to Mitigate Pain and Anxiety among Children on Dialysis

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### Abstract

Pain and anxiety mitigation among children on dialysis is an important issue to be discussed, in addition to how non-pharmacological strategies can help in making this mitigation through the pediatric nurse. **The study aimed to** evaluate the effect of non-pharmacological strategies to mitigate pain and anxiety among children on dialysis. **Research design:** A quasi-experimental research design was utilized. **Setting:** The study was conducted in the Pediatric Dialysis Unit at Sohag University Hospital. **Sample:** A purposive sample that included 80 children on dialysis was selected and studied within six months. They were divided into two equal groups; 40 children in the intervention group “who applied non-pharmacological strategies” and 40 children in the control group. **Tools:** three tools were used: 1<sup>st</sup> tool included demographic characteristics of studied children and their parents, and medical record sheets of the studied children, 2<sup>nd</sup> tool included Numeric Pain Rating Scale and 3<sup>rd</sup> tool included Hamilton Anxiety Rating Scale. **Results:** A highly statistical significant was found regarding the total mean scores of pain and anxiety between the intervention and control groups, where the children in the intervention group had little total mean scores of pain and anxiety levels after receiving non-pharmacological strategies, compared to children in the control group. **Conclusion:** Non-pharmacological strategies that were used in this study had a good effects in mitigate pain and anxiety among children on the dialysis. **Recommendation:** Application of non-pharmacological strategies by nurses in the care for children on the dialysis to mitigate pain and anxiety.

**Keywords:** Pain, Children on dialysis, Anxiety, Non-pharmacological strategies.

### Introduction:

Chronic kidney disease (CKD) is an evidence of structural or functional kidney abnormalities such as abnormal; urine analysis, imaging studies, or histology that persist for at least 3 months, with or without decreasing of glomerular filtration rate (GFR) (**Webster et al, 2017**). End-stage renal failure (ESRF) is a total loss of kidney function; it is a common problem worldwide. The number of children with chronic kidney disease is about 18.5-58.3 / million child worldwide (**Gulati, 2015**).

It occurs when a disease or condition impairs kidney function, causing kidney damage to worsen over several months or years. This includes; a fetal developmental problem, systemic lupus erythematosus, overuse of some medications such as non-steroidal anti-inflammatory drugs (NSAIDs), kidneys injury, diabetes mellitus, hypertension,

obstructed urine flow, kidney diseases, kidney artery stenosis, certain toxins, (**Kolvek, 2017**).

Treatment of chronic kidney disease includes hemodialysis, peritoneal dialysis, or a kidney transplantation. Hemodialysis uses a machine to filter the blood outside the body, in peritoneal dialysis; specific fluid is placed into the abdominal cavity and then drained, with this process being repeated multiple times per day. Kidney transplantation involves surgically placing a kidney from someone else (**Bethesda, 2009**). Pediatric nurse is presumed to have substantial role for children on dialysis and to assume dual responsibilities of health education and therapeutic management of those children. Also, nurses should have experiencing concentrated exercise and training, a novel therapeutic linguistic, technical skills, and compound daily practices for lasting illness supervision while concurrently treatment child's anxieties around well-being, pain,

unpredictable future and chance and dangers of transplant and preserving their routine function. (Wightman et al, 2019).

Assumed that the greatest children are attended by a maternal or another caregiver who may continue with the child through dialysis therapy, the necessity to encompass the caregiver in descriptions around maintenance exercises and measures also improve nursing accountabilities and responsibilities (Saroja & Moulik, 2020).

Children under dialysis suffering from pain. Intravenous injections are a common source of pain. Many children, in addition to suffering pain during venipuncture, also experience anxiety before, during dialysis, which can heighten a child's pain perception, resulting in a negative experience. Because pain can have several detrimental long-term implications, alleviation of pain and suffering is an important obligation of nurses caring for children (Kennedy et al, 2018).

Pain is one of the most common health problems in children, and its occurrence under abnormal physiological conditions is thought to be the body's most significant protection mechanism. Because assessing pain in children can be difficult, a variety of age-specific pain treatment instruments and ratings have been developed (Srouji & Ratnapalan, 2017).

Chronic renal failure in children is a major risk factor for the onset of psychological disorders such as anxiety. Anxiety can arise as a consequence of genetic and psychosocial factors as a result of being sick, hospitalization, procedures, dangerous environment, being unwell; which may lead to metabolic problems so, developmental delay. Anxiety can make things worse by disrupting cardiac and neurological systems, lowering immunological function, or altering dietary conditions. It can also have an impact on child's compliance (Lopes, 2018).

Also, anxiety is thought to have an impact on symptom management, medication adherence, medical result, and the child's or teen's capacity. Anxiety is seen as one of the most essential characteristics of health-related quality of life, this is why children suffering from anxiousness should be detected early and

treated accordingly (Gandhi et al, 2018). Despite the growing importance of anxiety in somatic diseases, there were varied information on its occurrence in children with chronic kidney disease (CKD) in the dialysis stage (Bakr et al, 2017).

Pediatric nurses especially have focused on promoting both painless and less painful natural methods in caring for children (Eskandari et al, 2016). The pharmacological methods of pain relief can affect the child; but the alternative modalities became popular to resolve these obstacles of pharmacological pain relief treatments. Also, non-pharmacological methods such as aromatherapy, massage therapy, relaxation techniques, breathing exercises and music therapy have been implemented to can reduce pain and anxiety (Miquelutti et al, 2018).

Using non-pharmacological strategies for dealing with anxiety in children included Holy Qur'an listening, encouraging the child to face what he fears, telling the child that it is normal to not be perfect, focusing on the positive, establishing a schedule of relaxation activities, following a model approach to behavior, reward the child for his brave behavior, establish a good sleep regime, encourage the child to express his anxiety, helping the child to solve problems, and keep calm, and doing relaxation exercises lead to decrease levels of pain sensation (Miquelutti et al, 2018). Nurses should relieve a child's suffering not only because of the consequences of unrelieved pain but also because pain management may have benefits such as earlier mobilization, shortened hospital stays, and reduced costs, and test the importance of using inexpensive non-invasive procedures that did not have any side effects during research in managing pain and anxiety as Holy Qur'an listening strategy among Muslims children (Abbas et al, 2016).

Using non-pharmacological strategies play an important role in the management of chronic kidney disease in children is not only to prevent progression to end-stage renal disease but to fulfill the physiological and emotional needs of children to the best possible quality of life. Also, treatment should maintain normal growth and development (Sajid et al, 2018).

Nurses are the main link between the pediatric hemodialysis unit and parents. So, they must have different skills that equipped them to communicate and cooperate with parents who help in the prevention of social, physical, and psychological problems to their children as early as possible (Gray & Draibe, 2015). Children undergoing hemodialysis require specialized nursing care, including the establishment of a therapeutic and interpersonal relationship, treatment of physical symptoms, and attention to the functional limitations, mental disorders, and educational needs of those patients (Stavropoulou et al, 2017).

Pediatric nurses are the main health care providers who provide care for children and their most important responsibility is to identify the essential care of children undergoing hemodialysis (Vafaei, Fouly, & Hassan, 2017). Pediatric nurses are the main cornerstone of care and directly deal with the ill child (Bayoumi, 2018). Health education and training should be provided to children to improve their health status who are undergoing hemodialysis. Moreover, there is an intense need to raise their awareness. Therefore, this study will provide adequate information about optimal pain and anxiety relief that should be offered to children who are suffering from chronic renal failure and undergoing hemodialysis (Hassona, 2015).

#### Significance of the study:

Chronic kidney disease (CKD) is a progressive deterioration of kidney function in which the body metabolism, water, and electrolyte balance have been disturbed resulting in uremia. More than 90,000 children die annually worldwide due to renal failure (Gulati, 2015). In Egypt, the estimated annual incidence of end-stage renal disease (ESRD) is around 74/million and the total prevalence of children on dialysis is 264/million (El-Arbagy et al, 2016). Also, the incidence of chronic renal failure among pediatric patients on hemodialysis is around 15 per million a year (Al-Shammari, 2021) As Chronic kidney disease (CKD) affects the growth and development of children, children on dialysis have an intense need to provide care through palliative non pharmacological strategies to achieve an optimal level of growth and

development. (Chaturvedi & DeBaun, 2016; Hockenberry & Wilson, 2018). The care of children who received hemodialysis is critical to lessen the complications, improve consequences during hemodialysis, improve children quality of life, and to enhance their social productivity. Subsequently, these children required a complex and specialized curative in all aspects of the child's hemodialysis therapy (Chand et al, 2017).

The problems of pediatric pain and anxiety is substantial; so much that research efforts also have focused on advancing preventive interventions designed to interrupt the escalation of symptoms. In the clinical child and adolescent area; the prevention of pediatric anxiety and pain is as important as its treatment. Several studies show that pediatric anxiety can be prevented via brief, non-pharmacological interventions. Treatment and prevention efforts offer strong promise in reducing pain symptoms levels (Stoll & Pina, 2016).

#### Operational definition:

##### Non-pharmacological strategies:

Non-Drug Options that mitigate pain and anxiety as: Massage, Relaxation techniques as breathing techniques which are often very effective, particularly when a patient or a caregiver is feeling anxious., Acupuncture, Physical therapy, Pet therapy, Gel packs. All of these strategies can provide patients with a sense of control and comfort (Falkensteiner et al, 2011).

#### Aim of the study

To evaluate the effect of using non-pharmacological strategies to mitigate pain and anxiety among children on dialysis through:

- Assess pain level among children on dialysis.
- Assess anxiety level among children on dialysis.
- Implement non-pharmacological strategies among children on dialysis to mitigate pain and anxiety.
- Evaluate the effect of using non-pharmacological strategies to mitigate anxiety and pain among children on dialysis.

**Research hypothesis:**

Children on dialysis who are using non-pharmacological strategies exhibit a mitigation in pain and anxiety levels.

**Subjects and Method:****Research design:**

A quasi-experimental research design. This design is important to the nature of the study issue, having one or more group subjects observed on pre and post manipulations to achieve the objective of the study. (Maciejewski, 2020).

**Setting:**

This study was done in the Pediatric Hemodialysis Unit at Sohag University Hospital, it consisted of two rooms, each one containing four beds. These settings were selected due to they had a higher children's attendance rate; it serves the biggest region of the population from rural and urban regions in Sohag city

**Sample:**

A purposive sample of all attended; included 80 children on dialysis was selected to achieve the aim of this study within six months. They were divided into two equal groups, 40 children in the intervention group (who used non-pharmacological strategies) and 40 children in the control group and met inclusion criteria.

**Inclusion criteria included:**

Children with chronic renal failure and undergoing hemodialysis who visited the previously mentioned settings, children of both sexes aged from 7-18 years old and who agree to participate in the study or consent is obtained from caregivers.

**Exclusion criteria included:**

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

**Tools of data collection:**

Data were collected using the following three tools as following:

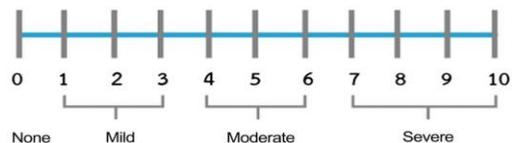
**Tool (I):- Demographic characteristics of studied children and their parents, and medical record sheets** of the studied children on dialysis was developed by the researchers through reviewing related literature; it was written in Arabic and divided into two parts which include:

**Part 1 (10 items):**

- Demographic data of studied children (4 items): age, gender, educational level, and residence.
- Demographic data of parents of studied children (6 items) as: age, educational level, and occupation for both mothers and fathers.

**Part 2 (5 items):** Included data about medical history of studied children as previous hospitalization, family history, duration of beginning of first hemodialysis, types of vascular access, and vascular access complication.

**Tool (II): Numeric Pain Rating Scale (NRS) adopted from Farrar et al, (2008)**, used for assessment of the pain intensity, the child is asked to indicate the numeric value on the segmented scale that best describes their pain intensity, consists of **(11 points)** numeric rating scale, with 0 representing "no pain" and 10 "unbearable pain. It used twice by individual interview with researchers pre, post manipulation.



**Tool III: Hamilton Anxiety Rating Scale (HAM-A) adopted from Hamilton (1959).**

Written in the form of sheet had multiple choice questions, the children are interviewed individually, each child had chance to choose one answer in each item according to level of anxiety for each question, it used twice pre, post manipulation. It used to assess the severity of symptoms of anxiety, it should take approximately ten to fifteen minutes to administer. The scale consists of **(14 items)**, each defined by a series of symptoms, and measures both psychic anxiety (mental agitation and psychological distress) and

somatic anxiety (physical complaints related to anxiety) as following:

1. Anxious mood: Worries, anticipation of the worst, fearful anticipation, irritability.
2. Tension: Feelings of tension, fatigability, startle response, moved to tears easily, trembling, feelings of restlessness, inability to relax.
3. Fears: of dark, of strangers, of being left alone, of animals, of traffic, of crowds.
4. Insomnia: Difficulty in falling asleep, broken sleep, unsatisfying sleep and fatigue on waking, dreams, nightmares, night terrors.
5. Intellectual: Difficulty in concentration, poor memory.
6. Depressed mood: Loss of interest, lack of pleasure in hobbies, depression, early waking, diurnal swing.
7. **Somatic** (muscular): Pains and aches, twitching, stiffness, myoclonic jerks, grinding of teeth, unsteady voice, increased muscular tone.
8. Somatic (sensory): Tinnitus, blurring of vision, hot and cold flushes, feelings of weakness, pricking sensation.
9. Cardiovascular symptoms: Tachycardia, palpitations, pain in chest, throbbing of vessels, fainting feelings, missing beat.
10. Respiratory symptoms: Pressure or constriction in chest, choking feelings, sighing, dyspnea.
11. Gastrointestinal symptoms: Difficulty in swallowing, wind abdominal pain, burning sensations, abdominal fullness, nausea, vomiting, loss of weight, constipation.
12. Genitourinary symptoms: Frequency of micturition, urgency of micturition, amenorrhea, menorrhagia (in adolescent female)
13. Autonomic symptoms: Dry mouth, flushing, pallor, tendency to sweat, giddiness, tension headache, raising of hair.
14. Behavior at interview: Fidgeting, restlessness or pacing, tremor of hands, furrowed brow, strained face, sighing or rapid respiration, facial pallor, swallowing.

#### Scoring system:

**Numeric Pain Rating Scale (NRS):** the child is asked to indicate the numeric value on the segmented scale that best describes their pain intensity, consists of 11 point numeric rating scale, with 0 representing “no pain” and 10 “unbearable pain, then scores from (1-3) mild pain, (4-6) moderate and (7-10) severe pain.

#### Hamilton Anxiety Rating Scale (HAM-A)

: The evaluator is instructed to assess the extent to which the patient displays the given criterion. Each item is scored independently based on its point, ratio scale. A rating of 0 indicates that the feeling is not present in the child. A rating of 1 indicates mild prevalence of the feeling in the patient. A rating of 2 indicates moderate prevalence of the feeling in the patient. A rating of 3 indicates severe prevalence of the feeling in the patient. A rating of 4 indicates a very severe prevalence of the feeling in the patient. To implement the Hamilton Anxiety Rating Scale, the acting clinician proceeds through the fourteen items, evaluating each criterion independently in form of the five-point scale described above.

Upon the completion of the evaluation, the clinician compiles a total, composite score based upon the summation of each of the 14 individually rated items. This calculation will yield a comprehensive score in the range of 0 to 56. It has been predetermined that the results of the evaluation can be interpreted as follows. A score of 17 or less indicates mild anxiety severity. A score from 18 to 24 indicates mild to moderate anxiety severity. Lastly, a score of 25 to 30 indicates a moderate to severe anxiety severity.

#### Validity of the tools:

The researchers assured the validity of the tools' content by showing them to 3 experts professors in pediatric nursing. They didn't require any modification to any of the items.

#### Reliability of the tools:

- Reliability was estimated by Alpha Cronbach's test in SPSS V.20, for the tool and its result was 0.84.
- Numeric Rating Scale (NRS), reliability analysis found an interclass correlation coefficient of 0.83 ( $P < 0.001$ ) (Farrar et al,

2008).

- Hamilton Anxiety Rating Scale (HAM-A) has shown good evidence of test-retest ( $r_s = 0.76$ ,  $p < 0.001$ ) and inter-rater ( $r_s = 0.51$ ,  $p < 0.001$ ) reliability as well as construct validity among children (Hamilton, 1959).

#### A pilot study:

The pilot study was conducted on 10% of the total study sample (8 children on dialysis) to ensure the clarity, applicability of the measures, and the time needed to be completed, necessary modifications are done, children involved in the pilot study were excluded from the study.

#### Administrative and ethical considerations:

Official permission was obtained from the responsible authorities, of the hemodialysis unit of the Pediatric Medical department at Sohag University Hospital to obtain approval for conducting the study at the previously selected setting. The researchers explained the aims and nature of the study to the children and their parents who is with the child in hemodialysis unit. Furthermore, they were informed about participation and probability of study withdrawal at any time, they were also ensured of the confidentiality of their personal information. In addition, oral consent was obtained from the parent and each child to gain their cooperation.

#### Field work:

The researchers reviewed the current local and international related literature to be more acquainted with the problem, to design the study measures, and to finalize them by using scientific books, articles, magazines, and the internet. The actual fieldwork was carried out from the beginning of January 2021 to the end of June 2021 at Pediatric Hemodialysis Unit at Sohag University Hospital in Egypt. The researchers introduced themselves to the pediatric members in the previously mentioned settings. The researchers explained the nature and the purpose of the study to gain their cooperation. The researchers used the following phases in the study (Assessment, Implementation, and evaluation phase:

#### 1- Assessment Phase:

- Before starting this study, administrative approval was taken from authorities in the setting. Also, permission was obtained from the Deans of Faculty of Nursing at Sohag, and Port Said University.
- The numbers and names of the children were taken from the medical records of the dialysis unit in the hospital, and they were tried to be arranged according to age, gender, and assessed children who met inclusion criteria in two lists, each list contained 40 children. List was chosen as the intervention group and the other was the control group.
- The researchers collected baseline data. explain the study's goal to the nurses and doctors working in the previously stated setting. The researchers also interviewed each child individually and their parents, introduced themselves, and obtain oral consent after explaining the purpose of the study, the full explanation of each tool was given. The researchers collected their demographic data, assessed children's pain and anxiety by the previously used tools.
- The researchers were available to collect data three days a week, from 8:00 a.m. to 1:00 p.m. and sometimes from 2:00 p.m. to 7:00 p.m. to meet as many children as possible, as the duration of hemodialysis ranged from 4 to 5 hours. The parents were quizzed on their children's illness, and fistula-related information (tool I). It took roughly 10 minutes to complete this stage.
- The forty children in intervention group list were divided into four groups, each group consisting of ten children. A 4 non-pharmacological strategies was applied to each group separately. The four strategies were chosen according to the applicability with the children in the dialysis unit
- **Pretest:** when the medical staff began to put the each child in intervention and control group on dialysis, the pain score (tool II) was marked by the researchers using the Numeric Rating Scale according to the child choice of the number that represent the degree of pain during dialysis needle insertion.

- After that, the researchers asked each child in intervention and control group about 14 items relating to the child's anxiety symptoms including both psychic anxiety and somatic anxiety (physical complaints). Then the researcher gave a score to each item using a Hamilton Anxiety Rating Scale to cover tool (III) which took about 15-20 minutes to calculate it.

## 2- Implementation phase:

The researchers prepared the children. The forty children in the intervention group list were divided into four groups, each group consisting of ten children. A selected 4 non-pharmacological strategies was applied to each group separately that used to mitigate pain and anxiety before hemodialysis started to distract their attention during needle insertion. The four strategies were chosen according to the applicability with the children in the dialysis unit

### 1. First strategy “rewarding a child for his brave behaviors” in the 1st group: (Jennifer, 2002):

- The researcher tells the child that if he faces his fears while installing the intravenous dialysis needle, it will reduce the feeling of pain and no anxiety and the researcher should reward him with praise and appreciation, and give him a bar of valuable chocolate, juices or sometimes money for older children according to what the child likes, and in the meantime, intravenous needle are installed, pain is measured, and then anxiety is measured, researchers actually fulfill the promise of reward for the brave child.

### 2. Second strategy “Steps In The Sky” (Davis, Eshelman & McKay, 2008), in the 2nd group using the following steps:

- The researcher makes the child close his eyes and remain still, then ask him to imagine himself lying outside in an open area looking at the moving clouds in the sky.
- He asks him to imagine clouds in different shapes, such as his favorite shapes.
- He is asked to imagine a ladder of clouds, extending from where he lays to the top of

the sky. And then he starts climbing the ladder and relaxing with each step to the top. He can also build himself a secret hideout between the clouds, and in the meantime, intravenous needle are installed, pain is measured, and then anxiety is measured.

### 3. Third strategy “Frog breathing” in the 3rd group: (Lange et al, 2011). The researcher told the child that the frog is calm, when it breathes, its abdomen swells and deflates slowly. The frog enters the air through the nose by inflating its stomach like a ball, and then throws the air through the mouth to contract very quietly. Inhale, exhale, and the researcher does this in front of the child and then asks him to blow stomach, then emptied it. Inhale, exhale, inhale, exhale, then the child regains his calm little by little.

- The researcher ask the child to take more than one slow, deep breath and do this with him, or have him imagine himself in a place that encourages relaxation such as the beach and close his eyes and try to listen and inhale, and feel everything associated with the image that he imagines, and in the meantime, intravenous needle are installed, pain is measured, and then anxiety is measured and
- Tells the child that he can do these techniques alone during times of pain and anxiety.

### 4. Forth strategy “Listen Holy Qur'an” in the 4th group:

(Healing verses) (Ibrahim, Shah & Mohd, 2017).

- ❖ Surah Al-Fatihah
- ❖ Surat Al-Ikhlās,
- ❖ Surat Al-Nas,
- ❖ Surat Al-Falaq
- ❖ Surah Al-Baqarah, **verse 255 al-Kursi**
- ❖ Surah Al-Baqarah, **last two verses**
- ❖ Surah Al-Shuara, **verse 80** .
- ❖ Surah Yunus, **verse 57**
- ❖ Surah Al-Isra, **verse 82**
- ❖ Surah Al-Raad, **verse 28**

The researchers placed these verses on the mobile and played them for the child for approximately seven to ten minutes, before, and during time the dialysis needle is inserted,

and the researcher begins to measure the pain and anxiety

- The fistula was cannulated while the child using non-pharmacological strategies, then the researchers recorded the scores of pain using the Numeric Rating Scale and assessed the anxiety level using Hamilton Anxiety Rating Scale
- Children were exposed to non-pharmacological strategies in addition to receiving routine care such as routine examination, drug administration, and laboratory investigation.
- Control group (Non-used non-pharmacological strategies); the same actions were also done for the control group, receiving routine care such as routine examination, drug administration, and laboratory investigation except using non-pharmacological strategies.

### 3-Evaluation phase:

**Posttest:** The researchers followed and evaluated the pain and anxiety levels of children as mentioned before immediately after receiving non-pharmacological strategies by intervention group, in addition to control group, using the same pre tools (II and III).

### Statistical analysis

All data were collected, tabulated, and statistically analyzed using SPSS 20.0 for windows (SPSS, Chicago, IL, USA 2011). Quantitative data were expressed as the mean  $\pm$  SD, and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Independent samples Student's t-test was used to compare between two groups of normally distributed variables. While Independent samples Mann –the Whitney test was used to compare between two groups of not normally distributed variables. Percent of categorical variables were compared using the Chi-square test or Fisher's exact test when appropriate. All tests were two-sided. P-Value  $< 0.05$  was considered statistically significant (S), and p-value  $\geq 0.05$  was considered statistically insignificant (NS).

### Results:

**Table (1)** revealed that the mean age of children in the control group was 10.9 $\pm$ 3.2 years, and 9.3 $\pm$ 4.4 years in the intervention group (using non-pharmacological strategies). Regarding gender, it was observed that 60% and 62% of children were boys in the control and intervention group respectively. As regard children residence 55% of children were from rural in control group and 65% of children in the intervention group were from urban. Finally, regarding educational level, it was observed that a high percentage;43% and 48% in the control and the intervention groups were in the primary level of education respectively.

**Table (2)** Showed that only 23% of children in control group and 20% in intervention group were previously hospitalized and 77% ,75% of them in the control and intervention groups respectively didn't have a family history of renal disorders. Regarding duration of beginning dialysis; 47% of children in both groups began dialysis about 2 years ago from the time of the study. Half of studied children in the control group had the only fistula as a vascular access for dialysis and the other half had both fistula and venous catheter while, 52% of children in the intervention group had both fistula and venous catheter. The high percentage in both groups; 30% and 27% in the control and intervention groups respectively reported that most vascular access complication was a pain.

**Table (3)** revealed that the mean age of mothers of the studied children in the control group was (30.9 $\pm$ 3.0) years, and (32.2 $\pm$ 4.1) years in the intervention group (using non-pharmacological strategies). As regard occupation 57% and 53% of mothers of the studied children in the control group and intervention group were housewives respectively. Regarding education level, it was observed that a high percentage 43% and 48% of mothers in the control and the intervention groups were able to read and write respectively.

Also, the same table illustrated that the mean age of fathers of the studied children in the control group was 32.9 $\pm$ 4.0 years, and 33.2 $\pm$ 4.3 years in the intervention group (using non-pharmacological strategies). As regard

occupation it was found that 78% and 57% of fathers of the studied children in the control group and intervention group were governorate working respectively. In addition, it was observed that a high percentage of 45%, 47% of fathers in control and intervention groups were had moderate education respectively.

**Fig.(1)** showed that;the intervention group (using non-pharmacological strategies) had little percentage of pain on numeric rating scale ( NRS) than control group after using non-pharmacological strategies .

**Table (4)** portrayed that there was a highly significant difference between control and intervention groups regarding total mean scores of pain on the numeric rating scale (NRS), where the intervention group (using non-pharmacological strategies) had little total mean scores of pain ( $3.05 \pm 2.8$ ) after using it, comparing with  $7.2 \pm 1.8$  pre using and  $7.4 \pm 1.9$  in control group after using non-pharmacological strategies.

**Figure (2)**, illustrated an improvement and reduction in anxiety levels percentage in the intervention group more than control group, severe anxiety reached to around 10 % in

intervention group compared to 35% in control group after using of non-pharmacological strategies;

Regarding anxiety total mean score level **Table (5)** showed that highly statistical significant were found among control and intervention groups ( $P=0.001$ ). Total mean scores of anxiety levels decreased and improved in the intervention group than in control group post receiving non-pharmacological strategies.

**Table (6)** revealed that a statistically significant reduction in pain and anxiety levels were detected in the intervention group pre and post using non-pharmacological strategies. It was observed that Holy Qur'an listening was the most effective non-pharmacological strategies used among the studied children in the intervention group in reducing pain and anxiety levels.

**Table (7):** Showed that there was a highly positive statistically significant difference between mean values of pain and anxiety among children in the intervention group pre and post using non-pharmacological strategies at  $P=0.001$ .

**Table (1):** Distribution of demographic characteristics of studied children among control and intervention groups

Demographic-characteristics of studied children	Control group (n=40)		Intervention group (n=40)		$\chi^2$	p-value
	No	%	No.	%		
<b>Age / years</b>						
7- < 13	23	57	21	53		
13-≤ 18	17	43	19	47		
<b>Mean ± SD</b>	10.9±3.2		9.3±4.4		t=0.33	0.73
<b>Gender</b>						
Boys	24	60	25	62	0.06	0.82
Girls	16	40	15	38		
<b>Residence</b>						
Urban	18	45	26	65	2.1	0.1
Rural	22	55	14	35		
<b>Education level</b>						
Primary level	17	43	19	48	0.12	0.74
Preparatory level	15	37	15	37		
Secondary level	8	20	6	15		

$P>0.05$ , statistically insignificant difference

**Table (2):** Comparison of the studied children according to their medical history among control and intervention groups

Medical history	Control group (n=40)		Intervention group (n=40)		$\chi^2$	p-value
	No	%	No.	%		
<b>Previous hospitalization</b>						
Yes	9	23	8	20	0.07	0.84
No	31	77	32	80		
<b>Family history of renal disorders</b>						
Negative	31	77	30	75	2.2	0.3
Positive	9	23	10	25		
<b>Duration of the beginning of hemodialysis from:</b>						
Less than 1 year	5	13	7	18	0.11	0.72
< 2 years	19	47	19	47		
< 3 years	8	20	6	15		
3 years and more	8	20	8	20		
<b>Types of vascular access</b>						
Fistula	20	50	19	48	0.06	0.74
Fistula and venous catheter	20	50	21	52		
<b>Vascular access complication</b>						
Edema	8	19	7	17	0.13	0.76
Thrombosis	6	16	7	18		
Pain	12	30	11	27		
Absent pulse	8	20	9	23		
Bleeding	6	15	6	15		

P>0.05, statistically insignificant difference

**Table (3):** Distribution of demographic characteristics of parents of the studied children among control and intervention groups

Demographic-characteristics	Control group (n=40)		Intervention group (n=40)		$\chi^2$	p-value
	No	%	No.	%		
<b>Mothers age/ years</b>						
20- < 30	15	37	23	57		
30≤ 40	25	63	17	43		
<b>Mean ± SD</b>	30.9±3.0		32.2±4.1		t=0.30	0.63
<b>Mothers occupation:</b>						
Work	17	43	15	37	2.3	0.1
Housewives	23	57	25	63		
<b>Mothers education level</b>						
Read and write	17	43	19	48	0.13	0.74
Moderate education	15	37	15	37		
High education	8	20	6	15		
<b>Fathers age/ years</b>						
20- < 30	15	38	12	30		
30≤ 40	25	62	26	70		
<b>Mean ± SD</b>	32.9±4.0		33.2±4.3		t=0.20	0.53
<b>Fathers occupation:</b>						
Governorate work	31	78	23	57	2.1	0.2
Manual work	9	22	17	43		
<b>Fathers education level</b>						
Read and write	12	30	15	39	0.15	0.56
Moderate education	18	45	19	47		
High education	10	25	6	14		

P>0.05, statistically insignificant difference

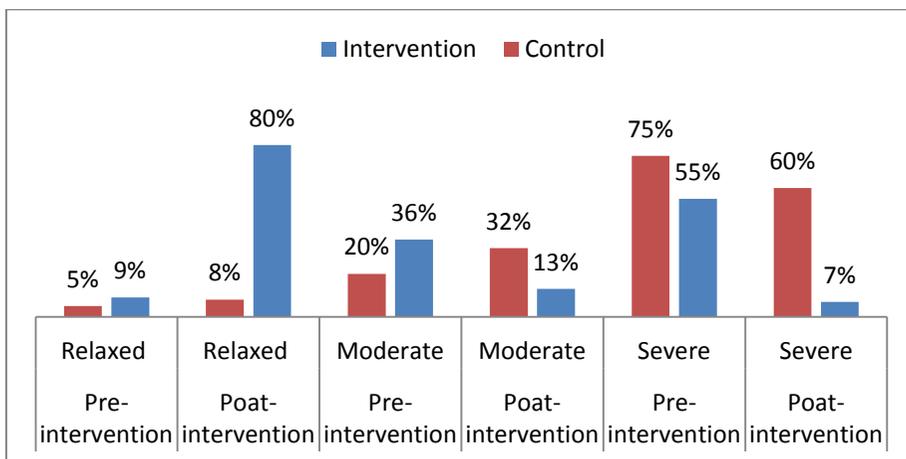


Figure (1): Comparison of pain levels on Numeric Rating Scale (NRS) among control and intervention groups pre and post using non-pharmacological strategies

Table 4: Comparison of total means scores of pain levels on (NRS) among the control and intervention groups pre and post using non-pharmacological strategies

Pain level	Controlgroup (n=40)		Intervention group (n=40)		p-value
	Pre	post	Pre	Post	
<b>Total Mean Scores of Pain on NRS</b>	7.2 ± 1.8	7.4 ± 1.9	7.2 ± 1.8	3.05 ± 2.87	0.001*

P<0.001, very highly statistically significant difference

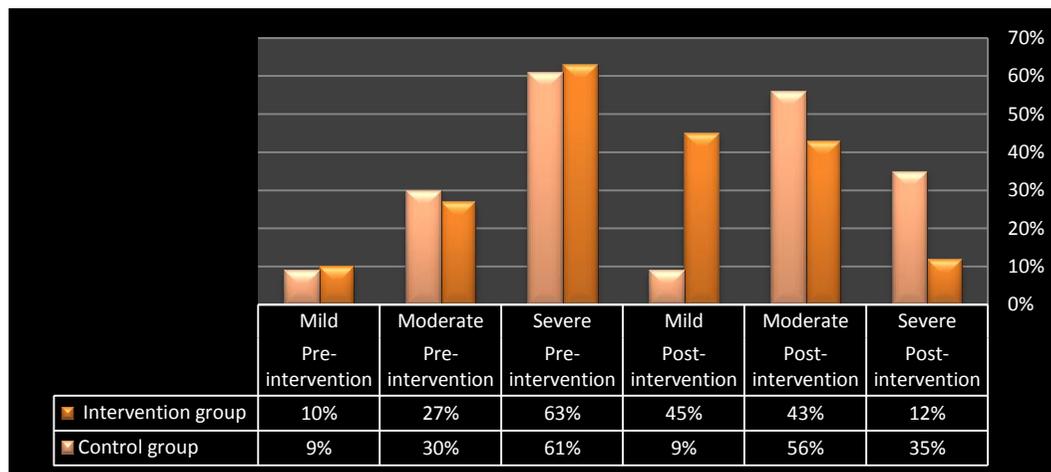


Figure (2): Comparison of anxiety levels on Hamilton Anxiety Rating Scale among the control and intervention groups pre and post using non-pharmacological strategies

Table 5: Comparison of total means scores of anxiety among the control and intervention groups pre and post using non-pharmacological strategies

Anxiety level	Controlgroup (n=40)		Intervention group (n=40)		p-value
	Pre	post	Pre	post	
<b>Total Mean Scores of Anxiety level</b>	26.3±3.6	27.3±2.6	27.1±1.7	19.2±2.3	0.001*

P<0.001, very highly statistically significant difference

**Table (6):** Comparison between the studied children in the intervention group regarding effect of using non-pharmacological strategies on pain and anxiety levels pre and post using them:

Non -pharmacological strategies (n=40) "10 child for each strategy"	Pain level		Anxiety level		p-va lue
	Intervention group (n=10)		Intervention group (n=10)		
	Pre	Post	Pre	Post	
Rewarding a child for his brave behaviors (10)	4.2±1.5	2.2±0.3	26.4±3.5	19.4±2.5	0.001*
steps in the sky strategy (10)	7.3±1.6	2.4±1.2	27.2±1.3	19.2±2.3	
Frog breathing exercises (10)	7.0±1.3	2.0±1.0	27.3±2.4	19.0±2.0	
Holy Qur'an listening (10)	4.2±1.7	<b>1.2±0.3</b>	26.4±1.3	<b>18.2±2.3</b>	

\* high statistical significant difference

**Table (7):** Comparison of total mean scores of pain and anxiety for intervention and control groups pre and post using non-pharmacological strategies

Variables	Control group		Intervention group	
	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Pain	7.2 ± 1.8	7.4 ± 1.9	7.2 ± 1.8	3.05 ± 2.87
Anxiety	26.4 ± 4.91	26.4 ± 6.72	27.3 ± 3.34	19 ± 3.08
	Paired 't' test=0.023 P-value =0.786 N S		Paired 't' test=21.23 P-value =0.001	

P>0.05, statistically insignificant difference

P<0.001, very highly statistically significant difference

**Table (8):** Correlation between non-pharmacological strategies, pain, and anxiety among the intervention group

Items	Correlation coefficient	
	Pain versus anxiety	
	R	P
Non-pharmacological strategies	<b>0.54</b>	<b>P=0.001**</b>

\*\* very high statistical significant difference

## Discussion:

From the most effective methods for reducing pain and anxiety during dialysis among children are to use non-pharmacological strategies. So, that this study was aimed to evaluate the effect of using non-pharmacological strategies to mitigate pain and anxiety among children on dialysis.

The results of the current study revealed that the mean age of children in the control group was 10.9±1.2 years, and 9.3±3.4 years in the intervention group (using non-pharmacological strategies). These findings are similar to those of **Javalkar, Ferris, Cuttance & Hooper, (2017)**, who studied 15 patients with end-stage renal disease (ESRD) who were on regular hemodialysis between the ages of 5 and 14 years at Zagazig University Hospital (**Youssef et al, 2012**). The majority of children according to results of the current study on hemodialysis since 2 years ago, Which means that they were affected at the age of approximately 7-9 years or earlier, The mean age at onset and presentation of CRF in

children is 5.9 and 8 years (**Pankaj Hari et al, 2003**).

It was observed that in this study that 60% and 62% of children were boys in the control and intervention group respectively, this is confirmed with fact that males more likely to suffer from chronic renal failure than females and exposure to dialysis (**Guzel, 2019**).

The current study's findings demonstrated a very significant difference between the control and intervention groups in pain levels, the intervention group having low mean pain levels on a numeric scale than in control group. This could be linked to the effectiveness of nonpharmacological pain management measures in lowering the concentration of children in pain during dialysis and assisting them in pain management. These findings are similar to those reported in a study by **Samaneh et al, (2017)** titled "Effects of Distraction on Physiologic Indices and Pain Intensity in Children Aged 3-6 Receiving IV Injection," which found a significant difference

in mean pain scores on a numeric scale between the control and other groups.

Similarly, **Belliemi et al, (2018)** investigated the "Analgesic effect of viewing TV during the medical procedure" and found that non-pharmacological techniques reduced the pain of catheters insertion in school-aged children. In addition, **Sinha et al, (2016)** discovered that distraction could reduce the pain and anxiety of stitching in children under the age of ten in their study about the evaluation of non-pharmacologic methods of pain and anxiety management for laceration repair in pediatric emergency department pediatric.

The findings of the present study were consistent with this of **Alavi et al, (2018)**, who found that utilizing non-pharmacological measures during pain management can lessen children's pain in their study of pediatric pain care by nurses in Shahrekord educational hospitals. On the other hand, these findings contradict those of **Bagnasco et al, (2018)**, who observed no significant variations in mean pain scores in children during venipuncture in their study. Also, **Mohamed (2015)** conducted an Egyptian study to evaluate the effect of selected distractors on the intensity of pain and fear in 50 children undergoing painful procedures in the pediatric surgical ward and discovered that more than half of the children in the pediatric surgical ward experienced severe pain during painful procedures in the pretest, and less than ten percent of them saw severe pain during painful procedures in the posttest.

The current study found that more than two-thirds of children in the intervention group (using non-pharmacological strategies) reduced anxiety. This could be because children's attention was focused by a distracting activity, and activation in pain and anxiety-related brain areas such the thalamus, insula, and anterior cingulate cortex was reduced (**Martin, 2018**).

The current study found that the intervention group (using non-pharmacological strategies) had lower anxiety levels than the control group, with a statistically significant difference of  $p=0.000$ . According to the researchers, it demonstrated the positive influence of non-pharmacological measures in

lowering anxiety. This finding is consistent with **McLaren & Cohen's (2015)** research, which examined and compared distraction tactics for venipuncture distress in children, finding that children in the movie condition were considerably less disturbed than children in the control condition ( $p=.001$ ).

According to the findings of the current study, listening to the Holy Qur'an was the most common non-pharmacological strategy for relieving pain and anxiety among children in the intervention group. According to the experts, this could be due to relaxation generated by Quran recitation. This could be because the harmonic sound of the Holy Quran is a type of spiritual music, which causes endorphin production by stimulating the brain and creating alpha waves. As a result, it raises the stress threshold, reduces bad emotions, promotes relaxation, and strengthens the immune system. Quran recitation can be utilized as a relaxing strategy as a new alternative medicine, which is even better than previous audio treatments since the Quran can produce delta waves, which provide relaxation and pain alleviation. This audio therapy is also a low-cost option (**Ghiasi & Keramat, 2018**). These findings are consistent with **Hamidiyanti and Pratiwi's (2019)** who studied, "Effect of Hearing to the Quran on Anxiety Level," which found that listening to the Quran was effective in reducing anxiety in the interventional community.

The current study found that there was a highly significant difference between mean values of pain and anxiety level among children pre and post application of non-pharmacological strategies at  $P=0.001$  level. From the researchers' point of view, this reflects the positive effect of using non-pharmacological strategies.

These results are supported by a study conducted by **Dawood et al, (2021)** entitled "Effect of Virtual Reality compared to Guided Visualization on Arteriovenous Fistula Cannulation pain and pain anxiety among hemodialysis children" and found these techniques application resulted in a reduction in the mean score of pain anxiety during hemodialysis among the studied children and divert the child's attention away from the

stressful stimuli. This finding is in the same line with the findings of (Afshar et al, 2018). In addition, Beizaee et al, (2018) matched with the current findings as they reported in their study about the " effect of guided imagery on anxiety, pain and vital signs in patients on hemodialysis", the anxiety level and pain were significantly lowered in the intervention group compared with the control group ( $p = 0.030$ ,  $p = 0.001$ , respectively).

The current study found that there was a positive correlation between the pain and anxiety of the studied children after using non-pharmacological strategies at  $p 0.001$ . From the researchers' point of view, it may be related to anxiety present among those children due to the insertion of needles and the hospital attendance three times weekly for treatment. Therefore alternative, affordable strategies should be used to absorb the children's negative perceptions during hemodialysis (Dawood et al, 2021).

### Conclusion:

Based on the results of the present study, it was concluded that children who were in the intervention group (using non-pharmacological strategies) had little mean scores of pain on numeric rating scale. Where the anxiety level was reduced in the intervention group after receiving non-pharmacological strategies, compared to children in the control group. Holy Qur'an listening was the most effective non-pharmacological strategies for mitigating anxiety and pain among children in the intervention group. Non-pharmacological strategies were effective for mitigating pain and anxiety among children on dialysis.

### Recommendations:

In the light of the findings obtained from the current study, the following recommendations were suggested:

- Children, nurses and parents education about non pharmacological strategies that distract and mitigate pain and anxiety among children on dialysis.
- Application of non-pharmacological strategies is recommended by children, parents and nurses caring for children on dialysis to mitigate pain and anxiety.

- Further research about comparing different non-pharmacological strategies used in caring for children on dialysis.
- Replication of the current study with a larger sample of children on dialysis in different settings is required for generalizing the results.

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