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Effect of Intradialytic Physical Exercise on Stress Level among Hemodialysis Children

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Abstract
Children receiving hemodialysis suffer from several psychological complications, and they need to receive safe, feasible, and applicable interventions to enhance their psychological wellbeing**. Aim of the study** was to evaluate the effect of intradialytic physical exercise on stress level among hemodialysis children. A quasi experimental research **design** was utilized in this study. **Subjects and Method** were children on hemodialysis from 6 to 18 years' old, enrolled at pediatric hemodialysis units of Assiut University Children's Hospital. They were selected and allocated randomly into two groups: study group who received intradialytic physical exercise and control group who received routine hospital care. **Two tools** were used to gather the required data, which included structured interview questionnaire for personal and medical data and perceived stress level scale. **Results:** After two months of intradialytic physical exercise, it was displayed that the majority of children in the study group had a low level of stress compared to children in the control group with highly statistically significant difference between the studied children according to total perceived stress level. **Conclusion:** Intradialytic physical exercise significantly decrease stress level among hemodialysis children. **Recommendation:** Intradialytic physical exercise should become an essential component of routine nursing clinical practice for hemodialysis children to improve psychological stress.

Keywords: Children, Hemodialysis, Intradialytic, Physical Exercise & Stress.

Introduction
Chronic kidney disease (CKD) is a complex and burdensome condition that significantly affects children's physical, emotional, and social well-being **(Dryjańska & Kiliś-Pstrusińska 2023)**. The accumulation of toxins and fluids in the body is caused by the progressive and irreversible damage that CKD does to the nephrons in both kidneys. In order to treat this illness, renal replacement therapy is necessary. The most standard and often used renal replacement therapy for children with renal failure is hemodialysis **(Ghafourifard et al., 2021).**

Hemodialysis (HD) is a chronic therapy with profound physical and psychological impacts on pediatric patients, physical and mental strain experienced by pediatric HD patients is multifaceted, stemming from a range of factors such as receiving a life -threatening diagnosis, being reliant on medical devices, undergoing painful fistula cannulation during dialysis, and the need for lifelong medication integration into their lives. Moreover, social restrictions, fear of losing their independence, and hopelessness further contribute to the psychological distress endured by these children. Collectively, these factors culminate in significant psychological burdens among pediatric HD patients **(Marthoenis et al., 2021).**

Stress is a common experience for children undergoing hemodialysis, particularly for those who require this life-sustaining treatment. Several studies have reported a high prevalence of stress among children with (CKD) undergoing hemodialysis. According to a study **(De Bruyne et al., 2023**) over 70% of children with CKD reported moderate to severe stress levels. Similarly, another study by **(Yarlioglu et al., 2023)** indicated that stress levels were significantly higher in children with (CKD) undergoing hemodialysis than in their healthy peers.

The physical, psychological, and social demands associated with hemodialysis can significantly impact these children's well-being. Unmitigated stress and anxiety in hemodialysis patients can hinder the treatment process and adversely impact their quality of life. Managing and addressing stress is a crucial element in enhancing children's overall well-being. Currently, several modalities are used to alleviate this issue, among them intradialytic physical exercise. Incorporating this approach can prove beneficial in promoting physical and mental health in these patients **(Zins et al., 2018)**.

Intradialytic physical exercise is one non-pharmacological strategy that reduces the negative effects of stress on children's mental and physical health. Regular exercise can promote a sense of accomplishment, self-confidence, and empowerment

in these children **(Meléndez et al., 2022).** Physical exercise has also been demonstrated to improve mood, reduce stress, and enhance overall psychological well-being. It also provides a positive and engaging outlet for children undergoing hemodialysis, helping them cope with the challenges of their condition and improving their overall quality of life **(Mohammed et al., 2023).**

However, children undergoing hemodialysis often face physical limitations and sedentary lifestyles due to their chronic condition and treatment. The importance of exercise programs for children receiving hemodialysis focuses on the benefits, considerations, and recommendations for implementing exercise interventions in this pediatric population **(Feldkötter et al., 2021).**

Recognizing and addressing stress in children with (CKD) is crucial for enhancing their overall well-being. Multidisciplinary healthcare teams should implement interventions to alleviate stress and promote coping strategies. Physical exercise can provide children with effective tools to manage stress and build resilience **(De Bruyne et al., 2023 & Khoury et al., 2023).**

Pediatric nurses play a critical role in caring for these children and have the opportunity to minimize stress and enhance their overall well-being. The roles of pediatric nurses in stress reduction among children receiving hemodialysis include their contributions to providing physical comfort, emotional support, education, and facilitating coping strategies **(Quigley et al., 2023).**

Significance of the study:

The high prevalence of chronic kidney disease and a significant rise in the number of children on hemodialysis, the need to perform hemodialysis lasting 4 hours twice a week, and the lack of activity and sedentary lifestyle among these children contribute to psychological problems such as stress. So it is necessary to plan and implement interventions to improve stress, such as physical exercise, which is a cost-effective, feasible, and inexpensive intervention to manage stress. Therefore, the main aim of this study was to practice and teach the hemodialysis children physical exercise in order to improve their psychological wellbeing and manage stress.

The aim of the Study: was to:

Evaluate the effect of intradialytic physical exercise on stress level among hemodialysis children.

Research hypothesis:

H1. Children undergoing hemodialysis who get intradialytic physical exercise are expect to lower stress level than children who not receive the physical exercise.

Operational definitions:

Stress: is a physiological or psychological response to internal or external stressors, and it is the score on the ten-question perceived stress scale.

Intradialytic physical exercise: It is the exercise that is done for children undergoing dialysis and includes a variety of techniques such as stretching exercise, isometric exercise and range of motion exercises.

Subjects and Method:

Research design:

A quasi experimental research design was used in the study

Setting:

The study was conducted at pediatric hemodialysis units of Assuit University Children's Hospital which is affiliated to Ministry of Higher education and scientific research.

Subjects:

Purposive sampling of 60 children undergoing hemodialysis enrolled from previous mentioned setting. They were selected, allocated randomly and divided into two equal groups:

Study group:

Which included children who received intradialytic physical exercise.

Control group: which included children who received routine hospital care as therapeutic medication and hemodialysis**.**

Inclusion criteria include:-

- Children aged from 6–18 years with chronic renal failure.
- Children were stable in physiological measurements on dialysis for 2 months.
- Free from lower extremity grafts and any lower limb pathology.
- Children didn't exercise for six months before treatment.
- Able to follow verbal commands.

Exclusion criteria include:-

- Children with physical disabilities.
- Children on tranquilizers or sedative medications.
- Children with a femoral dialysis catheter& internal jugular vein catheter.

Sample size:

G Power Software 3.1.9.7 was used to determine the sample size. Effect size (f)= 0.65, α error = 0.05, and actual power (1- β)=0.89 were used in a one-way ANOVA test with fixed effects. The test indicated a minimum sample size of 57 children, so we enrolled 60 children (30 children for each group) to account for any dropouts.

Tools for data collection:

The required data for this study was collected by using two tools:

Tool (1): Structure interview Questionnaire: It was included two parts:

Part one: Personal data of children such as (age, sex, birth order, educational level, parents' education and occupation).

Part two: Medical data such as (duration of illness, duration of hemodialysis treatment**,** number of sessions per week, age at disease diagnosis and associated diseases).

Tool (2): Perceived Stress Scale

The Perceived Stress Scale (PSS) **(Reis et al., 2010)** is a classic stress assessment instrument. This tool, helping us to understand how different situations affect feelings and our perceived stress. The questions in this scale asked about child feelings and thoughts. In each case, the child was asked to indicate how often felt or thought a certain way.

This scale consisted of 10 questions; each question was earn score from (0-4) according to their answer as the following:

4 means= very often 3 means= fairly often
2 means= sometimes 1 means= almost never
0 means = never

Scoring system: Individual scores on the Perceived Stress Scale ranged from 0 to 40, with higher scores indicating greater perceived stress.

Scores between 0 and 13 were categorized as low stress.

Scores between 14 and 26 were categorized as moderate stress.

Scores between 27 and 40 were categorized as high perceived stress.

Method of data collection

The research was conducted over a four-month period, from the beginning of July 2022 to November 2022, with each child requiring 60 minutes to complete the intervention. The intervention was conducted in four phases (preparatory, assessment, implementation, and evaluation phases).

Preparatory phase: it included the following

1. Official authorization was obtained from the director of pediatric hemodialysis units at Assuit University Children's Hospital to collect the necessary data for this study.
2. A pilot study was conducted on 10% (6) of the children to assess the clarity and applicability of the research tools and to estimate the time required to complete each sheet. No modifications were made, and the children who participated in the pilot study were included in the research.
3. Written informed consent was taken from the parents of each child participating in the study and they secured that the data were confidential and used only for research purpose. The parents had the right to withdraw from the study at any time during the study without any effect on the care provided for their children.
4. The reliability of the perceived stress scale in this study has good internal consistency ($\alpha = .86$).

Assessment phase:

The researcher went to the hospital and took children that were present in the hemodialysis unit, then made a random assignment of children to the study or control group then made a pretest for the study as follows:

- The researcher used the first tool to assess the personal and medical data of the children under investigation and their parents as each child and his parent was interviewed individually.
- Assessment of stress level for the studied children was done prior to intervention using a perceived stress scale.

Implementation phase:

When the child was connected to the hemodialysis machine, the intradialytic physical exercise was conducted three days per week, giving an interval of 24 hours between sessions. Depending on the child's exercise tolerance, each set was performed with 10 repetitions, gradually increasing to 15 repetitions. This procedure was continued for 2 months as follows:

- In the first hour, the child didn't do any activity,
- In the first 20 min of the second hour of hemodialysis, the child received stretching exercise. This is a form of physical exercise in which the calf, gastrocnemius, soleus, hamstring, and quadriceps muscles are flexed or stretched at a frequency of ten times per session.
- In the first 20 min of the third hour, the child received isometric exercise. This is a type of strength training that involves the contraction of the muscle (close chest press and pull, extended chest press, overhead press, biceps curl, stomach extensions, quad sets, hamstring set, hip abductor and adductor) for three to five seconds and then relaxation at a frequency of ten times per session.
- Finally, for the first 20 min of the fourth hour, the child practiced range of motion exercise in which the shoulder, elbow, hip, and foot were flexed or stretched to improve the muscle's elasticity and tone and reduce cramps and fatigue during hemodialysis at a frequency of twice per session.
- To prevent disconnection of the needle, exercise was not performed on the body parts connected to the dialysis machine. Instead, exercise was carried out on other body parts. Furthermore, patients were instructed to discontinue exercise and report any adverse effects to the researchers. If a patient became unstable, the exercise was stopped.

For the control group: children received only routine hospital care as therapeutic medication and hemodialysis**.**

Evaluation phase:

After two months of intradialytic physical exercise, the level of stress was flow up ,reevaluated and comparison between the two groups was done.

Ethical consideration:

A research proposal was approved by the local Ethical Committee in the Faculty of Nursing at Assiut University (IRB: 1120230303). Each parent of a child who participated in the study provided written informed consent, and it was ensured that the information would be kept private and used only for research purposes.

Statistical analysis:

Statistical Package for Social Sciences (SPSS) V.26 was used to organize, categorize, code, tabulate, and analyze the acquired data. Numbers, percentages, averages, and standard deviations were used to portray data in tables and charts. The Pearson correlation between variables was employed, and the chi-square test was performed to determine statistical significance. t-test was used to compare the means of variables. A P-value of 0.05 was declared statistically significant.

Results:

Table (1): Percentage distribution of studied children regarding to their personal data n=60.

Children's personal data	Study group(n=30)		Control group(n=30)		p-value
	No	%	No	%	
Child age/ years:					
6 <10 years	3	10.0	8	26.7	0.249
10<14 years	11	36.7	9	30.0	
14:18 years	16	53.3	13	43.3	
(Mean±SD)	10±6.55		10±2.64		
Gender:					
Male	21	70.0	18	60.0	0.417
Female	9	30.0	12	40.0	
Birth order:					
1st	6	20.0	9	30.0	0.711
2nd	11	36.7	12	40.0	
3rd	7	23.3	5	16.7	
4th and more	6	20.0	4	13.3	
Level of education:					
Illiterate	3	10.0	3	10.0	0.991
Primary education	12	40.0	13	43.4	
Preparatory education	8	26.7	7	23.3	
Secondary education	7	23.3	7	23.3	
Consanguinity of parent:					
Positive consanguinity	19	63.3	20	66.7	0.787
Negative consanguinity	11	36.7	10	33.3	

Chi-square test

Table (2): Percentage distribution of studied children according to their medical data n=60.

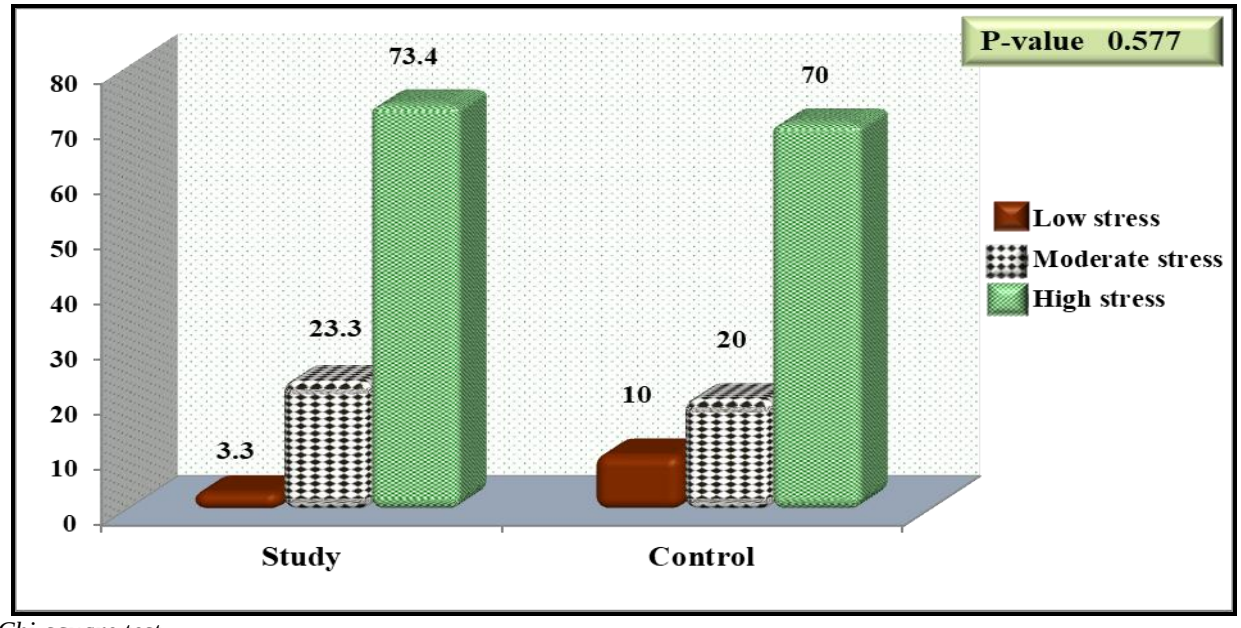
Medical data	Study group(n=30)		Control group(n=30)		p-value
	N	%	N	%	
Onset of disease/Years (mean±SD)#	8.30±3.42		7.71±3.24		0.522
Age at disease diagnosis (Mean±SD)#	10.46±3.25		9.61±3.01		0.192
Cause of renal failure:					
Unknown cause	8	26.7	10	33.3	0.734
Congenital anomalies	11	36.7	12	40.0	
Glomerulonephritis	7	23.3	3	10.0	
Nephrotic syndrome	3	10.0	4	13.4	
Lupus nephritis	1	3.3	1	3.3	
Associated diseases:					
Yes	11	36.7	14	46.7	0.432
No	19	63.3	16	53.3	
If yes					
Hypertension	7	63.6	10	71.4	0.678
Other	4	36.4	4	28.6	

T-test

Table (3): Percentage Distribution of studied children according to their hemodialysis therapy n=60.

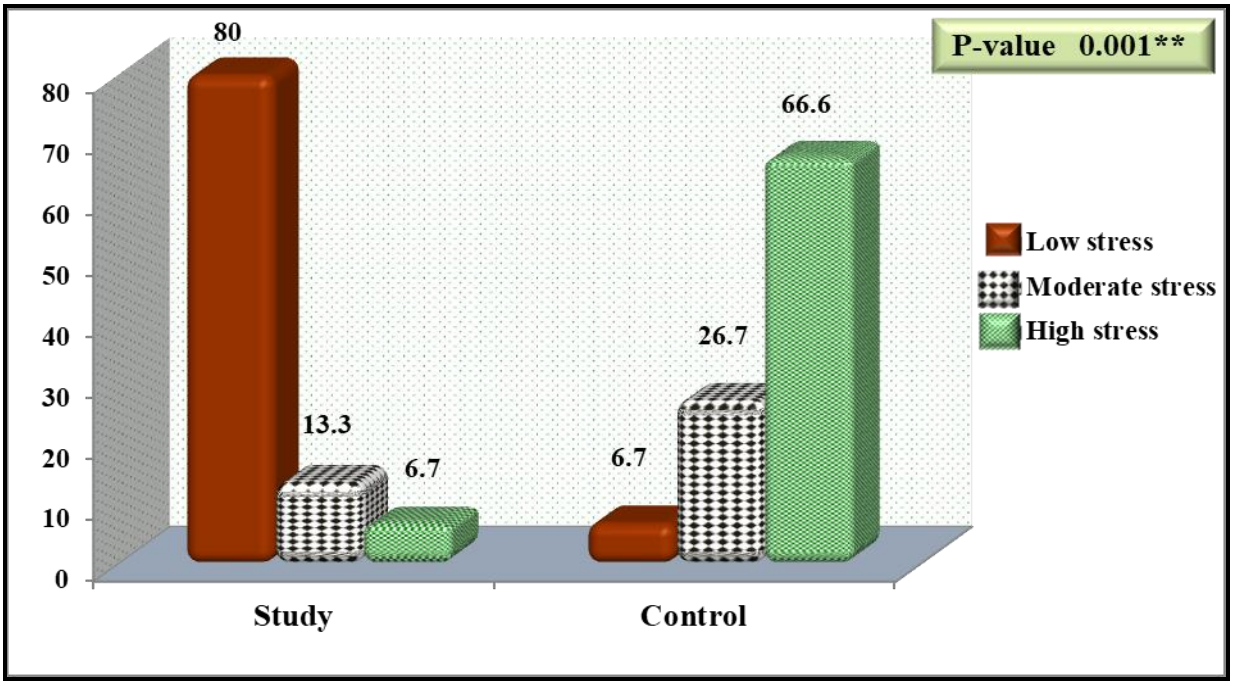
Hemodialysis therapy	Study group(n=30)		Control group(n=30)		p-value
	N	%	N	%	
Duration of hemodialysis therapy/ years:					
<one year	6	20.0	6	20.0	0.515
1<5 years	16	53.3	16	53.3	
5<10 years	8	26.7	6	20.0	
10 years	0	0.0	2	6.7	
Number of session per week:					
Two sessions	2	6.7	3	10	0.573
Three sessions	28	93.3	27	90	
Duration of each session/ hour:					
3 hours	0	0.0	1	3.3	0.131
4 hours	29	96.7	28	93.4	
5 hours	1	3.3	1	3.3	
Dialysis access:					
Arterial venous shunt	9	30.0	8	26.7	0.774
Arterial venous fistula	21	70.0	22	73.3	
Complications during dialysis session:					
Yes	3	10	2	6.6	0.405
No	27	90	28	93.4	
If yes					
✓ Dizziness, confusion and headaches	1	33.3	0	0.0	
✓ Muscle cramps	1	33.3	0	0.0	
✓ Hypotension	0	0.0	1	50	
✓ Hypertension	1	33.3	1	50	

Chi-square test



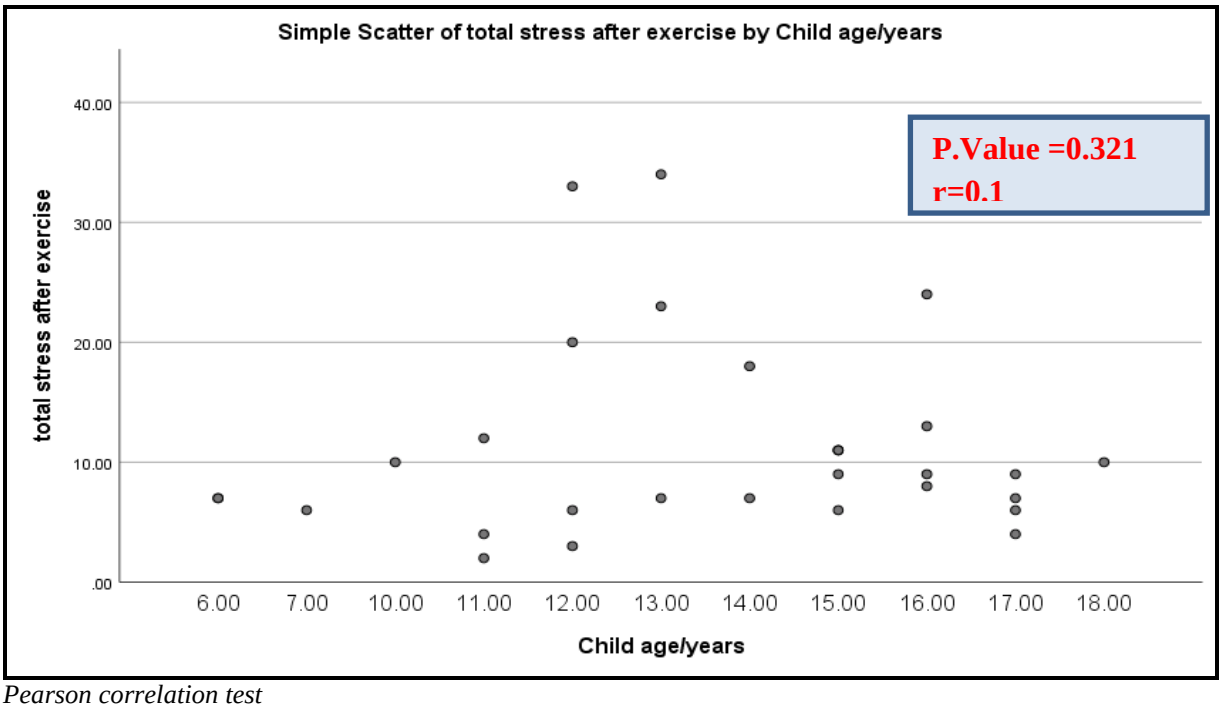
Chi-square test

Figure (1): Studied children according to total perceived stress level before intradialytic physical exercise n=60



Chi-square test *(**) highly statistical significant difference (p-value <0.01)*

Figure (2): Studied children according to total perceived stress level after intradialytic physical exercise n=60



Pearson correlation test

Figure (3): Correlation between children' age and total perceived stress level in the study group after intradialytic physical exercise n=30

Table (4): Relation between total perceived stress level and the studied children's personal data after intradialytic physical exercise n=60

Children's personal and medical data	Total perceived stress level after exercise						p-value 1	p-value 2
	Study group(n=30)			Control group(n=30)				
	Low	Moderate	High	Low	Moderate	High		
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
Child gender:								
Male	16(66.7)	4(100.0)	1(50.0)	2(50.0)	4(50.0)	13(65.0)	0.329	0.705
Female	8(33.3)	0(0.0)	1(50.0)	2(50.0)	4(50.0)	7(35.0)		
Child birth order:								
1st	5(20.8)	0(0.0)	1(50.0)	3(75.0)	2(25.0)	6(30.0)	0.805	0.254
2nd	8(33.3)	2(50.0)	1(50.0)	0(0.0)	5(62.5)	7(35.0)		
3rd	6(25.0)	1(25.0)	0(0.0)	1(25.0)	1(12.5)	3(15.0)		
4th and more	5(20.8)	1(25.0)	0(0.0)	0(0.0)	0(0.0)	4(20.0)		
Residence								
Urban	5(20.8)	1(25.0)	5(20.8)	2(50.0)	3(37.5)	8(40.0)	0.751	0.913
Rural	19(79.2)	3(75.0)	19(79.2)	2(50.0)	5(62.5)	12(60.0)		
Child level of education:-								
Illiterate	2(8.3)	0(0.0)	2(8.3)	0(0.0)	0(0.0)	3(15.0)	0.479	0.496
Primary education	10(41.7)	2(50.0)	10(41.7)	3(75.0)	5(62.5)	7(35.0)		
Preparatory education	6(25.0)	1(25.0)	6(25.0)	1(25.0)	2(25.0)	4(20.0)		
Secondary education	6(25.0)	1(25.0)	6(25.0)	0(0.0)	1(12.5)	6(30.0)		
Cause of renal failure:								
Unknown cause	7(29.2)	1(25.0)	0(0.0)	1(50.0)	3(37.5)	6 (30.0)	0. 13	0.462
Congenital anomalies	8(33.3)	3(75.0)	0(0.0)	1(50.0)	2(25.0)	9(45.0)		
Glomerulonephritis	6(25.0)	0(0.0)	1(50.0)	0(0.0)	0(0.0)	3(15.0)		
Nephrotic syndrome	3(12.5)	0(0.0)	0(0.0)	0(0.0)	3(37.5)	1(5.0)		
Lupus nephritis	0(0.0)	0(0.0)	1(50.0)	0(0.0)	0(0.0)	1(5.0)		
Associated diseases:								
Yes	8(33.3)	1(25.0)	2(100.0)	0(0.0)	4(50.0)	10(50.0)	0.01*	0.01*
No	16(66.7)	3(75.0)	0(0.0)	2(100.0)	4(50.0)	10(50.0)		

Pearson chi-square test , *(*) Statistical significant difference (p-value <0.05)*
(P-value 1) relation between children's personal data and stress level in the study group after physical exercise,
(P-value 2) relation between children's personal data and stress level in the control group after physical exercise

Table (1): Shows the distribution of studied children regarding their personal data. It was noted that more than half (53.3%) of children in the study group, compared to less than two-fourths (43.3%) in the control group were in the age group 14–18 years old. Regarding child gender, more than two-thirds (70%) of children in the study group, compared to more than half (60%) in the control group, were male. Also, the majority (80%) of children in the study group were from rural areas, compared to less than two-thirds (60%) in the control group. It was also observed that more than two-thirds (63.3% &66.7%) of the studied children's parents had positive consanguinity respectively.

Table (2): Represents distribution of studied children according to their medical data. It was observed that in more than one third of the studied children (36.7%& 40%) the mean cause of renal failure was due to congenital anomalies in the urinary system. It was also shown that more than half (63.3% & 53.3%) of the studied children didn't have any disease associated with renal failure.

Table (3): Presents the distribution of the studied children according to their hemodialysis therapy. It was found that more than half (53.3%) of the studied children, the duration of hemodialysis was from 1 to 5 years. In relation to the number of sessions per week, most (93.3% & 90%) of the studied children had three sessions per week. Also, this table enumerated that the vast majority (96.7% & 93.4%) of studied children, the duration of each session was 4 hours, and dialysis access was done by using an arterial venous system (70% & 73.3%) respectively.

Figure (1): Illustrates that there was no statistically significant difference between studied children according to total perceived stress level before intradialytic physical exercise (P.Value =0.577).It was found that (73.4%& 70%) of the studied children

had high stress levels, respectively, compared to only (3.3%& 10%)of studied children who had low stress level before applying intradialytic physical exercise.

Figure (2): Presents that that there was highly statistically significant difference between studied children according to total perceived stress level after applying intradialytic physical exercise (P.Value =0.001).It was shown that the vast majority (80%) of children in the study group had a low level of stress compared to only (6.7%)in the control group.

Figure (3): Represents correlation between children's age and stress level in the study group after intradialytic physical exercise. It was found that there was no statistically significant correlation between children's age and stress level with (P.Value=0.321).

Table (4): Shows that no significant association between total perceived stress level and personal and medical profile variables like (gender, child birth order, residence, and cause of renal failure) but there was a significant association between total perceived stress level and children who have associated diseases with renal failure (P.Value =0.01.*).

Discussion

Children with (CKD) often perceive hemodialysis sessions as a time drain that fosters feelings of hopelessness and emptiness, leading to a negative emotional and cognitive view of the world **(Burrai et al., 2019).** Furthermore, stress is a common mental health issue in such children, linked to factors such as needle usage, persistent pain, sleep disturbances, ongoing inflammation, fatigue, and frequent hospital stays for treatment. Consequently, a cost-effective, alternative intervention should be used to counteract the negative perceptions of hemodialysis and improve the children's quality of life **(Saraiva et al., 2018).** Intradialytic physical exercise is one non-pharmacological approach that can reduce stress and is both safe and feasible to administer. Therefore, this study aimed to assess the effect of intradialytic physical exercise on stress level among hemodialysis children.

According to the findings of the current study, it was noted that no statistically significant difference was found between the studied children regarding their personal data, which indicates that the studied subjects were matching. Also, findings revealed that more than half of children in the study group compared to less than two-fourths in the control group were in the age group 14–18 years (Tab1). It can be hypothesized that the adoption of an unhealthy lifestyle and the delay of treatment for pre-existing comorbidities have adversely impacted the integrity of the renal system in children. These results align with the findings of a study by **(H Salama et al., 2022)** which reported that the mean age of children in the study and control groups was 11.28 ±2.84 and 12.04 ±3.29 years, respectively. And also in agreement with **(Gheissari et al., 2012**) who conducted a study on chronic kidney disease in children and found that children receiving hemodialysis had an average age of 11.01± 0.39 years.

As shown in the present study related to the gender of the studied children the majority of children were male (Tab1). This is sanctioned suggesting that males generally have larger kidneys than females, which may make them more susceptible to certain kidney-related conditions. Additionally, males may have different hormonal profiles that can affect kidney function. These findings were consistent with **(Saghaei et al.,2021)**, **(Neugarten & Golestaneh., 2013), (Mahmoud et al., 2022)** also with **(Guzel et al., 2019)** they studied the effect of gender on acute kidney injury developing in the intensive care unit and reported that acute kidney injury in the intensive care unit was more prevalent in males than female.

Result of current study also illustrated that there was no statistically significant difference between studied children according to total perceived stress level before intradialytic physical exercise. It was found that the majority of the studied children had a high stress level (Fig1). This might be explained as the child's experience with dialysis 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 stress **(Marthoenis et al., 2021)**. These results were in accordance with **(Nurdina et al., 2022)** who observed that the average distress thermometer score for pre-test stress was high, which decreased in the post-test.

Concerning the impact of intradialytic physical exercise on stress among hemodialysis children, the current study denoted that highly statistically significance difference was found between the studied children according to total perceived stress level after applying intradialytic physical exercise. It was shown that the vast majority of children in the study group had a low level of stress compared to children in the control group after two months of physical exercise (Fig 2). This could be interpreted in light of many theories as, exercise can help reduce the levels of stress hormones, such as cortisol in the body. High levels of cortisol are associated with chronic stress and can have negative effects on physical and mental health. Exercise can also increase the production of endorphins, which are the body's natural feel-good chemicals. Endorphins can help promote feelings of happiness and well-being, which can help counteract

the negative effects of stress. Finally engaging in physical activity can provide a distraction from stressors, allowing children to focus on something positive and enjoyable **(Asbury., 2020).**

These results were supported by **(Lestari, 2020)** who found that, the intradialytic exercise had a significant outcome on stress level in hemodialysis patients. As the participants in the study group showed a decrease in the score of stress compared with those in the control group. And also in agreement with **(AmirthaSanthi et al., 2018)** who indicate that exercise program has reduced depression, anxiety and stress and improved quality of life in hemodialysis patients.

In addition ,these results were similar to the results of a study done by **(Amirkhani et al., 2021)** found that the patients' level of stress prior intervention was high compared to after the intervention which indicated that resilience training significantly reduces stress in hemodialysis patients. Also, this finding was in harmony with the result of **(Kang & Chae., 2021)** which revealed that, hemodialysis patients who engaged in motor exercise experienced low physiological stress levels compared with those in the control group.

Finally, the current study indicated that, there was no significant association between total perceived stress level and personal and medical profile variables like (age ,gender, child birth order, residence and cause of renal failure) but there was a significant association between stress level and child associated diseases (Tab 4,Fig 3). It can be explained by the research as the fact that comorbidities are common in children with CKD and can have a significant impact on their overall health and well-being. The presence of this associated disease can impact a child's psychological wellbeing in a number of ways, such as increasing symptoms, limiting activities, and increasing the burden of treatment which ultimately increases stress in children. This finding was in line with a study conducted by **(Baek et al., 2017)** who cited that the child's self-reported total health score was significantly affected by the presence of comorbid chronic diseases.

Conclusion

Intradialytic physical exercises were more successful at lowering their overall perceived stress level among hemodialysis children, and highly statistically significant differences were found between children in the study and the control groups. Additionally, there was a significant association between stress level and the existence of associated diseases linked to renal failure.

Recommendations

Based on the results of the current study, the following recommendations are suggested:

1. Physical exercises should become an essential component of routine nursing clinical practice for children receiving hemodialysis to decrease stress level.
2. A simple manual of guidelines for physical exercise and their benefits should be made and keep it available at unit to be provided to newly admitted children
3. Further studies should be done on a large sample size and different hospitals

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