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Applying Acupressure Strategy to Mitigate Consequences of hemodialysis among Children with chronic renal failure

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Abstract:
Hemodialysis causes thirst, xerostomia and interdialytic weight gain, which negatively impact the quality of life for pediatric patients. Acupressure is a non-invasive, cost-effective strategy that can complement conventional medical care for children undergoing hemodialysis. **aim of study:** to evaluate the effectiveness of applying acupressure strategy in mitigating the consequences of hemodialysis among children with chronic renal failure. **Subject and Methods: design**: A Randomized controlled trial was used in present study. **Setting:** Hemodialysis unit at Assiut University Children's Hospital. **Subjects:** Purposive sample of fifty children were randomly allocated to study and control groups, 25 subjects for each. **Tools of data collection:** four tools were used to collect data 1- Interview questionnaire form to assess Personal and Medical Data. 2- Thirst Inventory Questionnaire to identify occurrence of thirst. 3- Xerostomia Inventory to quantify perceived xerostomia 4- Interdialytic Weight Gain to measure body weight. **Results:** revealed that, there is a decrease in thirst, xerostomia and interdialytic weight gain from 24.04 ± 1.97, 33.76 ± 3.55 and 1.5 to 7.60 ± 0.87, 11.92 ± 1.22 and 0.0 (respectively). **Conclusion:** the present study concluded that acupressure intervention was effective in mitigating thirsty and xerostomia, which significantly decreases intradialytic weight gain among children undergoing hemodialysis. **Recommendation:** The study was highly recommended for utilizing acupressure to children undergoing hemodialysis for its significance in mitigating thirst, xerostomia and interdialytic weight gain.

Keywords: Acupressure, Hemodialysis, Interdialytic Weight Gain, Thirst & Xerostomia.

Introduction:
Chronic renal failure is a progressive and often irreversible condition that develops over months to years. In children, it poses a global health challenge due to its rising prevalence, serious prognosis, and substantial treatment costs (**Vaidya & Aeddula, 2024).**
Chronic renal failure (CRF) can be worsened by congenital or acquired conditions. In children under five, congenital anomalies in the kidney or urinary tract defects are the leading causes of CRF. In contrast, acquired CRF is often associated with glomerulonephritis, which is more common in children over five (**Maalej et al., 2018).**
Chronic kidney disease (CKD) in children is a significant global health concern, with prevalence estimates ranging from 15 to 74.7 cases per million children. In Europe, the incidence is reported to be around 11–12 per million age-related population. These statistics highlight the substantial burden of CKD among the pediatric population, underscoring the need for early detection and comprehensive management strategies to mitigate progression and improve outcomes **(Kamath et al., 2020).**
In Egypt, based on the records of Out Patient Clinics and Dialysis Units of 11 universities, 1018 child patients were suffering from CRF and the age of 56.7% of them ranged from 1 to 19 years **(Shaban, 2021).**
Hemodialysis (HD) is the primary therapeutic intervention for pediatric patients suffering from severe, irreversible kidney failure. According to the International Pediatric Nephrology Association **(IPNA),** approximately 12.9 per million children under the age of 19 necessitate this treatment. Hemodialysis (HD) employs a specialized device to effectively eliminate waste products from the bloodstream and restore its chemical equilibrium **(National Kidney Foundation [NKF], 2018).**
Thirst is a common, intense, and often inadequately addressed symptom among children undergoing hemodialysis (HD). This craving for fluids drives them to drink more water than necessary and plays a crucial role in maintaining fluid balance **(Abdelsamie et al., 2022).**
One of the main barriers to HD children's adherence to fluid restriction is xerostomia, which refers to the sensation of oral dryness caused by reduced salivary production (**Talha & Swarnkar, 2023).** While the

unstimulated salivary flow rate in healthy people ranges between 0.3 and 0.5 mL/min, about half of HD patients have a rate below 0.1 mL/min, and 60–77% of the patients experience severe thirst and xerostomia **(Yang et al., 2019)**.

Xerostomia and hyposalivation may intensify sensations of thirst and contribute to the intake of fluids and excessive inter-dialytic weight gain (IWG). that may lead to fatal complications such as hypertension, congestive heart failure, and death **(Bruzda-Zwiech et al., 2018).**

Thirst and xerostomia can be effectively managed by using pharmacological and non-pharmacological techniques that complement each other. Non-pharmacological techniques include mechanical measures such as chewing gum and acupressure or hydrotherapy such as sucking ice, saliva substitutes, mouthwashes, and behavioral and psychological interventions **(Abdelsamie et al., 2022).**

Acupressure is a non-invasive practice rooted in traditional Chinese medicine, extensively utilized in China for the promotion of overall health **(Yang et al., 2020).** This technique involves the application of gentle yet firm pressure on designated acupoints by licensed professionals. Research indicates that acupressure can effectively mitigate symptoms of thirst by enhancing the residual secretory activity of the salivary glands **(Yang et al., 2020).**

The identified acupoints for addressing the consequences of hemodialysis include Lianquan (CV-23), located on the anterior midline of the neck in the depression above the hyoid bone; Chengjiang (CV-24), found at the center of the mentolabial groove directly below the lower lip; Yifeng (TE17), located posterior to the ear lobes in the depression between the mandible and mastoid process; and Dicang (ST-4), situated on the face below the pupil when the child looks forward, lateral to the corner of the mouth **(Chen, 2023).**

Dialysis nurse plays a vital role in providing information, care, support, understanding, and therapeutic counseling to pediatric patients and their families throughout the illness. Nursing management must be provided to the needs of children undergoing hemodialysis therapy to reduce the complications of renal function and the stresses of dealing with a life-threatening illness **(Al Rafay et al., 2021).**

Nurses play a crucial role in utilizing acupressure as a complementary approach to manage the consequences of hemodialysis among patients, particularly children. By integrating acupressure into routine care, nurses can alleviate symptoms and improve patients' overall quality of life **(Smith & Brown, 2021).**

Nurses' responsibilities include identifying appropriate acupressure points and applying the correct techniques to ensure safety and effectiveness. Nurses also educate patients and caregivers on performing acupressure, fostering self-management and continuity of care. Additionally, they monitor patients' responses to the therapy, document outcomes, and collaborate with multidisciplinary teams to adjust interventions as needed. By advocating for evidence-based complementary therapies like acupressure, nurses contribute to holistic patient care and enhance therapeutic outcomes for those undergoing hemodialysis **(Smith & Brown, 2021).**

Significance of the study:

Thirst and dry mouth are common symptoms among hemodialysis (HD) patients, with studies indicating that 60–77% of them experience these issues **(Sung et al., 2015).** Notably, increased thirst correlates with higher interdialytic weight gain (IWG), which elevates the risk of cardiovascular complications—the leading cause of death in end-stage renal disease (ESRD) patients (**Kugler et al., 2015).**

Regulating fluid intake for patients undergoing hemodialysis mitigates the negative impacts of fluid overload on morbidity and mortality (**Ker & Gangadharan, 2019).** Utilizing non-pharmacologic methods, like acupressure, effectively manages children's thirst and xerostomia, alleviating thirst and preventing serious complications related to inter-dialytic weight gain.

Aim of the Study:

This study aims to evaluate the effectiveness of applying acupressure strategy in mitigating the consequences of hemodialysis (thirst, xerostomia and inter-dialytic weight gain) among children with chronic renal failure.

Operational Definition

- **Strategy to Deal with Consequences of Hemodialysis** (**Acupressure):** is an ancient healing art that uses the fingers to press certain points on the body to stimulate the body's self-curative abilities (**Joseph, 2018).**

Consequences of Hemodialysis:

- **Xerostomia**: or dry mouth is defined by the Common Toxicity Criteria of Adverse Events **(CTCAEs)** as a disorder characterized by reduced salivary flow in the oral cavity, resulting in the sense of a dry mouth and sticky saliva **(Kapourani et al., 2022).**
- **Inter-dialytic weight gain:** is subtracting the child's weight at the beginning of dialysis session (before-weight) from the weight after the previous dialysis session (after –weight) (**Chazot et al., 2017**).

Research Hypothesis:
Children undergoing hemodialysis who receive acupressure are expected to exhibit fewer consequences than those who don't receive.
Null hypothesis:
Children undergoing hemodialysis who receive acupressure are just as likely as those who do not receive acupressure interventions related to the consequences of hemodialysis.

Subjects and Method:

Research design:
A Randomized controlled trial research design was undertaken in this study.
Setting:
The study was conducted at pediatric hemodialysis unit in Assiut University Children's Hospital which is affiliated to Ministry of Higher Education and Scientific Research. It is the only unit in Assiut city that is dealing with children undergoing hemodialysis and serves children of all Upper Egypt. A pediatric hemodialysis unit contains two rooms, each room contains 12 beds, children examination room, a room for nurse supervisor and a room for resident doctor.
Subjects:
A purposive sample of fifty children (all available children who met inclusion criteria) undergoing hemodialysis who were admitted to the previously mentioned setting and were selected and allocated randomly into two equal groups:
Group I: who received acupressure interventions **(study group)**
Group II: who received routine care (**control group**)
Inclusion criteria:
- Children whose ages ranged from 6-18 years.
- Both sexes
- Children undergoing hemodialysis for at least 3 months.
- Children who were free from diabetes mellitus, ischemic heart disease, and autoimmune disease.

Exclusion criteria:
Children who had inflammation or neuropathic disorders in acupressure points.
Randomization
The randomization process was carried out through a web-based randomizer (https://www.randomizer.org/) To allocate 25 children to each group (study & control).
A web-based randomizer is a free resource for researchers to generate random numbers or assign participants to experimental conditions. The researcher steed the numbers that wanted to generate then selected numbers per set and ran the randomization by clicking the button "Randomize" to produce the randomized output.

Data collection tools:
Four tools were used to collect the required data for this study:
Tool (I): Interview questionnaire form: This tool was developed by the researcher after reviewing the literature (**Al Rafay et al., 2021; Aljuaid et al., 2020; Kamath et al., 2020)** to obtain personal and medical data of children undergoing hemodialysis. It included two parts:
Part one: It included personal data of children: as age, gender, residence, and level of education.
Part two: It included medical data of children: as onset of disease, frequency, and duration of hemodialysis.
Tool (II): Thirst Inventory Questionnaire: This tool was adopted from (**Bots et al., 2004**) to assess the degree of thirst for patients undergoing hemodialysis. It comprised of 7 validated items; each item had a 5-point Likert scale ranged from never which equals 1 to very often which equals 5. The responses to the seven items were categorized as follows: (1) Never thirsty =7 points, (2) almost never thirsty =14 points, (3) occasionally thirsty = 21 points, (4) fairly often thirsty = 28 points and (5) very often thirsty =35 points. The thirst severity grade was divided into: mild thirst (7-14), moderate (15-21), and severe thirst (22-35).
Tool (III) Xerostomia Inventory Questionnaire:
The Xerostomia Questionnaire (XQ), adapted from the Korean version (**Lee et al., 2016**), assesses xerostomia severity in patients. It consists of 11 validated items rated on a 5-point Likert scale, ranging from "Never", scoring 1; "Hardly ever", 2; "Occasionally", 3; "Fairly often", 4; and "Very often", 5 with total scores from 11 (no dry mouth) to 55 (extremely dry mouth). The questions address dryness experienced while eating or chewing and during periods of not eating. The xerostomia severity grade was divided into: Mild xerostomia (11–22 points), moderate xerostomia (23–33 points), and severe xerostomia (34–55 points).
Tool (IV) weight assessment form:
It was developed by the researcher to assess the children's weight between two sessions of hemodialysis.
Methods:
- An official approval for conducting the study was obtained from the head of dialysis unit at Assiut University Children's Hospital after explaining the aim of the study.
- A pilot study was carried out on five children who undergoing hemodialysis to test the feasibility of the tools and accordingly, the necessary modifications were done. Those children were excluded from the study subjects.

- The researcher developed tools following a thorough literature review, and their content validity was assessed by a panel of five pediatric nursing experts—four from Assiut University and one from Sohage University—to ensure comprehensiveness, accuracy, clarity, and relevance.
- Internal consistency reliability was assessed using Cronbach's Alpha: 80% for the thirst inventory questionnaire (tool II), 86% for the xerostomia inventory questionnaire (tool III) while test-retest reliability shows a range of 0.48 to 0.827. Construct validity is indicated by Spearman's rho, $\rho = -0.515$. This indicates that the tools are reliable.
- Fidelity was achieved through receiving a special training in the field of acupressure at the Faculty of Physical therapy, sphinx University.

Interventions:

The researcher identified the Lianquan (CV-23) acupoint on the anterior midline of the neck, in the depression above the hyoid bone. Next, the ChengJiang (CV-24) acupoint was located at the center of the mentolabial groove, directly below the lower lip. The Yifeng (TE17) acupoint was found posterior to both ear lobes, in the depression between the mandible and mastoid process. Lastly, the Dicang (ST-4) acupoint was determined to be on the face, directly below the pupil when the child looks forward, and lateral to the corner of the mouth.

- The acupressure was performed by the researcher for three minutes during the hemodialysis session for each previously mentioned acupoints.
- The researcher applied the acupressure for children three times/ week for 4 weeks.
- The acupressure was performed in a circular movement, in a clockwise direction for three minutes for each acupoint during the hemodialysis session.
- Thirst was assessed weekly four times at the end of the first, second, third and fourth week by using tool two.
- For the control group, the researcher used sham intervention.
- **A sham intervention** is a procedure used in research, especially in clinical trials, to act as a placebo. This allows researchers to compare the outcomes of the actual intervention with the control (sham) to determine the intervention's true efficacy.
- Children's thirst and xerostomia were assessed at the first day and then for four times at the end of the first, the second, the third and the fourth weeks using tool II and III, respectively.
- The inter-dialytic weight gain was calculated by subtracting the child's weight after the dialysis session (after –weight) from the beginning of dialysis session (before-weight) for four times at the end of the first, the second, the third and the fourth weeks by using tool IV.
- Data for this study were collected for a period of 5 months from August 2023 to December 2023.

Analysis of data:

Collected data were revised and coded for computerized data entry using statistical package for social sciences (SPSS) version 19. Data were then verified prior to statistical analysis. Statistical methods were applied including descriptive statistics such as (frequency, percentages, mean and standard deviations). Statistical significance was considered at p-value> 0.05.

Ethical considerations:

- Approval of the research ethical committee of Faculty of Nursing, Assiut University was obtained to conduct the study (approval no. 1120220521).
- The director of hemodialysis unit approval was obtained to conduct the study.
- A written informed consent was obtained from every child's parent after explaining the aim of the study.
- Parents were assured that the data of this research used only for the purpose of research.
- Privacy of children were maintained
- Anonymity and confidentiality of the subjects were maintained and Children's participation was voluntary, child's parent had the right to withdraw from the study at any time without penalty.

Results:

Table (1): Distribution of the studied children related to their personal data

Personal data	Study (n= 25)		Control (n= 25)		X^2	P-value
	No.	%	No.	%		
Gender:						
Male	12	48.0%	14	56.0%	0.32	0.571
Female	13	52.0%	11	44.0%		
Age: (years)						
Mean ± SD	13.24 ± 3.47		13.40 ± 3.19		0.17	0.866
Range	6.0-18.0		6.0-18.0			
Residence:						
Rural	17	68.0%	20	80.0%	0.94	0.333
Urban	8	32.0%	5	20.0%		
Educational level:						
Illiterate	3	12.0%	6	24.0%	2.23	
Primary	12	48.0%	8	32.0%		0.52
Preparatory	4	16.0%	3	12.0%		
Secondary	6	24.0%	8	32.0%		

Table (2): Percentage distribution of the study and control group regarding medical data

Medical data	Study (n= 25)		Control (n= 25)		X^2	P-value
	No.	%	No.	%		
Onset of disease:						
3 - < 12 months	6	24.0	5	20.0		
12 months - < 3 years	7	28.0	6	24.0	1.63	0.652
3-5 years	8	32.0	12	48.0		
> 5 years	4	16.0	2	8.0		
Frequency of hemodialysis:						
Twice a week	5	20.0	6	24.0	0.12	0.733
Three times a week	20	80.0	19	76.0		
Duration of hemodialysis session:						
3 hours	2	8.0	0	0.0	3.0	0.223
4 hours	22	88.0	22	88.0		
5 hours	1	4.0	3	12.0		

Table (3): Comparison between Mean ± SD thirst inventory scale items before and after acupressure intervention among children in the study &the control groups

Thirst inventory Items	At baseline (before acupressure intervention)				After 4 weeks of acupressure intervention			
	Study (n= 25)	Control (n= 25)	T test	P-value	Study (n= 25)	Control (n= 25)	T test	P-value
	Mean ± SD	Mean ± SD			Mean ± SD	Mean ± SD		
Thirst is problem for me	4.20± 0.58	4.36± 0.64	0.35	0.729	1.36 ± 0.49	2.00 ± 0.50	4.57	0.000*
I am thirsty during the day	3.84 ± 0.55	4.12 ± 0.53	1.83	0.073	1.12 ± 0.33	2.04 ± 0.54	7.27	0.000*
I am thirsty during the night	3.12 ± 0.53	3.08 ± 0.40	0.30	0.763	1.00 ± 0.00	1.60 ± 0.50	6.0	0.000*
My social life is influenced because of my thirsty feelings	3.64 ± 0.64	3.64 ± 0.70	-0.0	1.000	1.08 ± 0.28	2.00 ± 0.29	11.41	0.000*
I am thirsty before dialysis	3.56 ± 0.58	3.88 ± 0.73	1.72	0.092	1.04 ± 0.20	2.00 ± 0.41		0.000*
I am thirsty during dialysis	2.84 ± 0.47	3.00 ± 0.41	1.28	0.206	1.00 ± 0.00	1.52 ± 0.51	10.52	0.000*
I am thirsty after dialysis	2.84 ± 0.37	2.92 ± 0.57	0.59	0.561	1.00 ± 0.00	1.48 ± 0.51	4.71	0.000*

(*) Statistically significant at p<0.05.

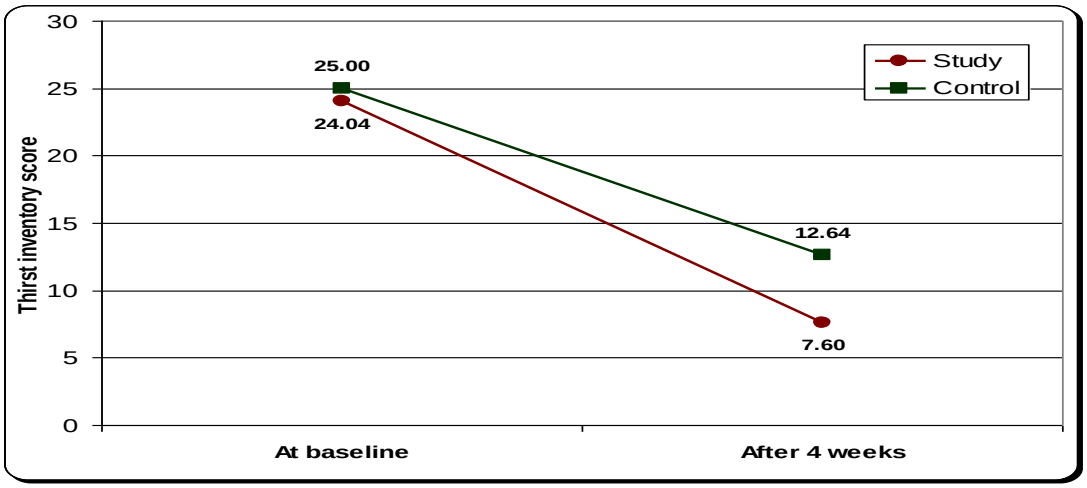

Figure (1): Comparison between total Mean ± SD thirst inventory scale items before and after acupressure intervention among children in the study &the control groups

Table (4): Comparison between Mean ± SD Xerostomia inventory items before and after acupressure intervention among children in the study &the control groups

Xerostomia inventory items	At baseline (before acupressure intervention)				After 4 weeks of acupressure intervention			
	Study (n= 25)	Control (n= 25)	T test	P-value	Study (n= 25)	Control (n= 25)	T test	P-value
	Mean ± SD	Mean ± SD			Mean ± SD	Mean ± SD		
My mouth feels dry	4.24 ± 0.52	3.88 ± 0.73	2.01	0.061	1.44 ± 0.51	2.00 ± 0.50	3.92	0.000*
I have difficulty eating dry foods	3.76 ± 0.44	3.60 ± 0.50	1.20	0.234	1.20 ± 0.41	1.84 ± 0.47	5.13	0.000*
I get up at night to drink	3.24 ± 0.44	3.00 ± 0.29	2.28	0.067	1.12 ± 0.33	1.56 ± 0.51	3.62	0.001*
My mouth feels dry when eating a meal	3.36 ± 0.49	3.16 ± 0.47	1.47	0.148	1.00 ± 0.00	1.60 ± 0.50	6.0	0.000*
I sip liquids to aid in swallowing food	3.48 ± 0.51	3.84 ± 0.62	2.24	0.066	1.12 ± 0.33	1.64 ± 0.57	3.95	0.000*
I suck sweets or cough lollies to relieve dry mouth	2.28 ± 0.89	2.04 ± 0.79	1.01	0.318	1.00 ± 0.00	1.32 ± 0.48	3.33	0.002*
I have difficulty swallowing certain foods	3.28 ± 0.61	3.52 ± 0.59	1.41	0.164	1.00 ± 0.00	1.64 ± 0.49	6.53	0.000*
The skin of my face feels dry	3.08 ± 0.49	3.36 ± 0.49	2.02	0.076	1.04 ± 0.20	1.60 ± 0.50	5.20	0.000*
My eyes feel dry	2.32 ± 0.69	1.88 ± 0.60	2.41	0.070	1.00 ± 0.00	1.32 ± 0.48	3.33	0.002*
My lips feel dry	3.08 ± 0.57	3.24 ± 0.52	1.04	0.307	1.00 ± 0.00	1.52 ± 0.59	4.41	0.000*
The inside of my nose feels dry	1.64 ± 0.49	1.56 ± 0.58	0.53	0.602	1.00 ± 0.00	1.24 ± 0.44	2.73	0.008*

(*) Statistically significant at p<0.05

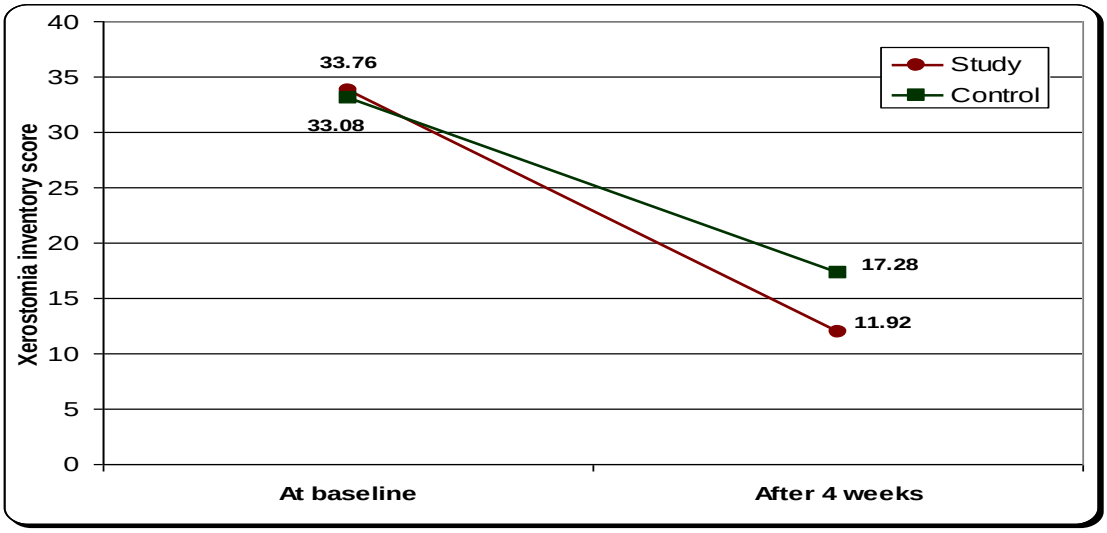

Figure (2): Comparison between study &control groups regarding xerostomia inventory total mean score before and after acupressure intervention

Table (5): Comparison between weight differences before and after acupressure intervention among children in the study and the control groups differences before and after acupressure intervention

Weight difference	Study (n= 25) Median (Range)	Control (n= 25) Median (Range)	P-value
At baseline before acupressure intervention	1.5 (0.0-3.0)	1.5 (0.0-3.0)	0.385
After 4 weeks of acupressure intervention	0.0 (0.0-1.0)	0.5 (0.0-1.5)	0.008*

(*) Statistically significant at p<0.05

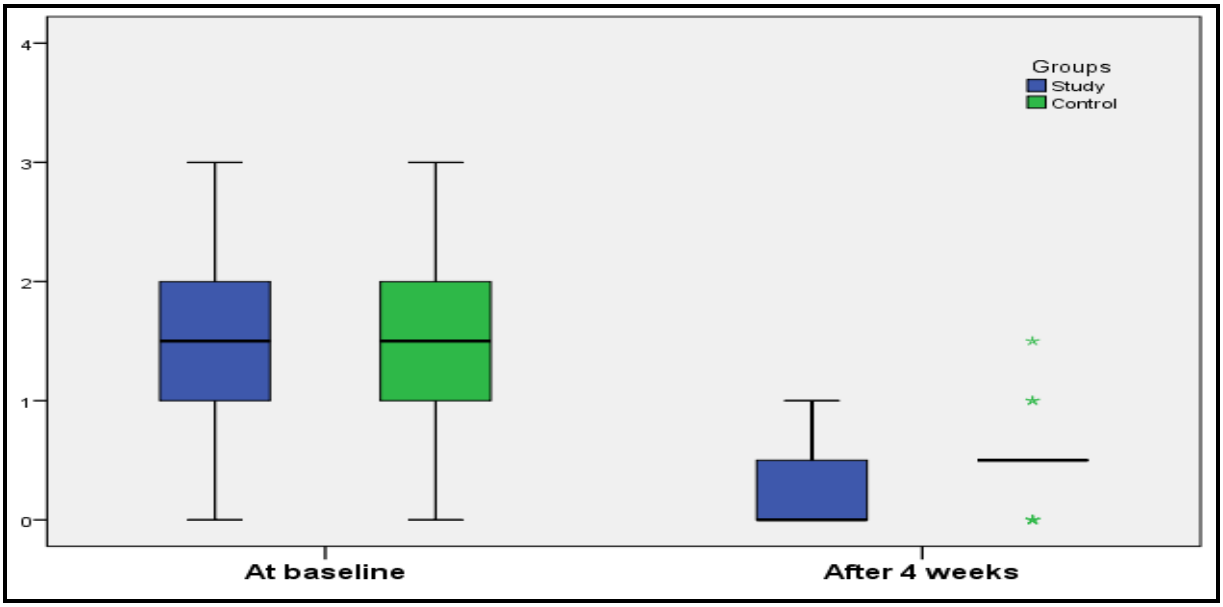

Figure (3): Weight differences before and after acupressure intervention among children in the study and the control groups

Table (1): Presents personal data of studied children. It was found that no statistically significant differences between children in the study and the control groups related all items in the table. Mean age± SD of children in study group was 13.24 ± 3.47 compared with 13.40 ± 3.19 of those in the control

group. The table also clarifies that, just over half of children (52%) in the studied group are females compared with 44%of those in the control group. The table also observed that, 68% of children in the studied group were from rural areas compared with 80% of those in the control group. it also found that near half 48% in studied group attended primary schools compared with 32% of those in the control group.

Table (2): Shows distribution of the studied children related to their medical data, it was found that no statistically significant differences between children in the study and the control group related to all items in the table. It was observed that 32% and 48% of the children in the study and the control groups had chronic renal failure for three to five years. Most of children in the two groups 80% and 76% respectively received hemodialysis sessions three times per week and 88% of them in both groups spent four hours on the hemodialysis machine.

Table (3): Indicates comparison between Mean ± SD thirst inventory scale items before and after acupressure intervention among children in the study &the control groups. It was found that no statistically significant differences between the two groups at baseline prior to acupressure intervention. At the end of the acupressure phase, thirst intensity was lower among children in the study group across all items compared to those in the control group, with highly statistically significant differences between the two groups (P-value = 0.000).

Figure (1): The figure revealed no statistically significant differences in thirst intensity scores among the studied groups at baseline before acupressure intervention. By the end of the acupressure phase, thirst intensity was lower compared to baseline, showing highly statistically significant differences among the studied groups (p = 0.000).

Table (4): Dcomparison between Mean ± SD Xerostomia inventory items before and after acupressure intervention among children in the study &the control groups. There were no statistically significant differences between the two groups at baseline prior to the application of acupressure. However, by the end of the acupressure phase, there was a significant reduction in xerostomia intensity across all measures among children in the study group compared to others in the control group P-values ranging from 0.008 to 0.000.

Figure (2): The figure revealed no statistically significant differences among the studied groups at baseline prior to the application of acupressure, with a Xerostomia inventory score. By the conclusion of the acupressure phase, the Xerostomia inventory score demonstrated a statistically significant reduction compared to baseline, indicating highly significant differences among the comparison groups (p-value = 0.000).

Table (5): Indicates comparison between weight differences before and after acupressure intervention among children in the study and the control groups. It was observed that no statistically significant differences between the two groups at the `baseline data before the acupressure intervention. By the end of the acupressure phase, weight differences were lowered among children in the study group than those in the control group with highly statistically significant difference between the two groups (P-value = 0.08).

Figure (3): The figure indicated no statistically significant differences between the two groups at baseline before acupressure intervention. By the end of the acupressure phase, weight differences compared to baseline were lowered, showing highly significant differences between the groups (p-value of 0.08).

Table (6): The table showed no statistically significant differences between the two groups at baseline prior to acupressure. By the end of the acupressure phase, xerostomia intensity was significantly reduced compared to baseline (P-value: 0.05-0.002).

Discussion:

Chronic renal failure (CRF) is a serious condition that significantly impacts the physical and psychosocial health of pediatric patients. Children with CRF undergoing hemodialysis often face limitations in their lifestyle, including dietary restrictions and fluid intake management, to effectively control their condition **(Aljuaid et al., 2020).**

Hemodialysis represents the most prevalent therapeutic intervention for pediatric patients experiencing advanced and irreversible kidney failure. This medical procedure utilizes a sophisticated apparatus to filter metabolic waste from the blood, thereby restoring its physiological balance. Nevertheless, hemodialysis is associated with a range of complications, which may include cardiovascular, nutritional, gastrointestinal, hepatic, endocrine, and vascular access-related complications, infections and hypertension **(Machaly et al., 2020).**

The growing demand for acupressure among the pediatric patients in recent years can be attributed to its demonstrated efficacy and positive safety profile. This therapeutic modality plays a crucial role in multidisciplinary approaches to addressing health problems and serves as an intervention that alleviates discomfort and reduces symptoms of countless disorders **(NCCIH, 2018).**

Acupressure is a noninvasive, safe, and easy-to-implement technique, making it suitable for

application in clinical practice to alleviate thirst **(Li et al., 2014)**. The current study found a significant reduction in thirst intensity mean scores during the second, third, and fourth weeks (P-value = 0.000) This improvement may be attributed to acupressure's ability to stimulate the autonomic nervous system to release neuropeptides (such as vasoactive intestinal polypeptide, neuropeptide Y, substance P, calcitonin gene-related peptide, and neurokinin A), which enhance saliva production and reduce thirst **(Bossola et al., 2018).**

The findings of the current study are consistent with those reported by **Keskin & Taşci (2021)**, who investigated the effects of acupressure on children undergoing hemodialysis. Their research demonstrated that acupressure significantly increased saliva production, alleviated thirst severity, and enhanced overall quality of life. Furthermore, **Yang et al., (2020)** concluded that acupressure serves as an effective intervention for improving salivary flow rates and diminishing thirst intensity. Several factors influence thirst including fluid restriction, reduced salivary secretion, biochemical and biological changes, and medication use. continuous thirst puts children in a state of intense stress, delaying and hindering the recovery, and reducing the quality of life.

This study noticed that there was an apparent decrease in the thirst among children in the study group than in control group throughout the sessions, this result aligns with findings of the research conducted by **Abdelsamie et al., (2022)** which suggests that acupressure may effectively mitigate thirst and reduce its negative impact on cognitive performance that were not evident in the control group.

The current study found that acupressure significantly reduced xerostomia scores and increased saliva secretion during the third and fourth weeks (P-value = 0.000) (figure 2). This improvement in xerostomia is due to increased saliva secretion, which was stimulated by activating the parasympathetic nervous system through targeted pressure on the thirst acupoint **(Bossola & Tazza, 2012)**. These findings align with those obtained by **Yang et al., (2017)**, who reported significant improvements in xerostomia and saliva secretion in a pilot observational study of a 4-week acupressure intervention for children on hemodialysis.

This study is consistent with the findings of a study carried out by **Bossola et al., (2012) & Dirschnabel (2011)**, who noticed that xerostomia constitutes a significant challenge for pediatric patients undergoing hemodialysis. Low salivary flow, mouth breathing, and changes in salivary composition are the mechanisms that contribute to its development.

This study revealed a significant decrease in interdialytic weight gain (IDWG) among children in the study group throughout the sessions (P-value = 0.008) (table 5). This finding is consistent with findings which reported by **Chang et al., (2021)**, who examined the effects of combining acupressure with a fluid-restriction adherence program on salivary flow rate, xerostomia, IDWG, and diet-related quality of life in children undergoing hemodialysis.

The study noticed that there was an apparent decrease in IDWG for both study and control groups throughout the sessions. This is attributable to interdialytic weight gain resulting from water accumulation in the body due to metabolism, dietary habits, and fluid intake **(Paglialonga et al., 2015).**

It is apparent from this study that there is a decrease in anxiety-related climatic change among children in the study group than in the control group throughout the sessions (P-value =0.002) **(table 6).** This result is consistent with a study conducted **(Arab et al., 2016),** in which Findings indicate that acupressure effectively alleviates anxiety symptoms in patients undergoing hemodialysis. Applying acupressure to specific anxiolytic points resulted in a significant reduction in anxiety scores, due to changes in the emotional state of the children from the release of endorphins and serotonin **(Sisodia et al., 2024).**

Limitation of the study:

Limitations of this study are, that the recruitment of participants was restricted to the pediatric hemodialysis unit in Assiut University Children's Hospital, and thus the findings may not be generalizable to other populations.

Conclusion:

The current study demonstrates that acupressure serves as an effective intervention for addressing thirst and xerostomia in pediatric patients, leading to a notable reduction in intradialytic weight gain and anxiety among children undergoing hemodialysis.

Recommendations:

The following recommendations are made in light of the study's findings:

1. Train nurses in the hemodialysis unit regarding acupressure intervention through conducting in-service training courses and workshops.
2. Incorporate acupressure intervention into pediatric hemodialysis unit policy as a highly successful non-pharmacologic intervention.
3. Replicate this research on a larger statistical sample size is recommended to obtain more generalizable results.

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