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Nutritional Status among pediatric Age Group with Chronic Renal Failure undergoing Hemodialysis

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الحالة التغذوية بين الفئة العمرية للأطفال المصابين بالفشل الكلوي المزمن الذين يخضعون لغسيل الكلى

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Abstract:

Background: Recently, food poisoning has become a growing public health problem worldwide, in both developed and developing countries. In developing countries, poor knowledge about food handling, safety, and hygiene may cause food-borne diseases.

Objective: to assess the knowledge, attitude, and practices (KAP) of food safety awareness among the public Libyan population.

Material and methods: A cross-sectional study was conducted on a random sample of hundred adult (male& symptoms of food poisoning (p value = 0.020female) from the public in Tripoli. The study period was from September 2022 to Nov 2023. The study was carried out using a face-to-face questionnaire in Arabic The questionnaire consisted of two parts: personal information, knowledge, attitude & Practice of food safety. The data analysis was performed using the Statistical Package for the Social Sciences (SPSS), Version 24.0. Descriptive statistics were conducted to determine the means, percentages, standard deviations, and frequencies. chi-square test (X2) was used to determine the association of knowledge and practices with demographics.

The Results: Our study found that the subjects were between the ages of 18-35 years (65.0%). Most respondents were males (75%). 43.0% of participants had a university degree, which is the majority. Out of 100 participants, 75 percent had great awareness of food poisoning, and 43% of them felt abdominal cramps, which are indications of food poisoning. The majority of respondents had medium income levels, with their percentage being 69.0%. However, there was a significant difference in knowledge, attitude, and practice about food poisoning (p values = 0.003, 0.004, 0.041, and 0.048, respectively), as well as a substantial correlation between educational level and understanding of the symptoms of food poisoning (p value = 0.020).

Keywords: Knowledge, Attitude, practice, food poisoning.

الملخص
في الآونة الأخيرة، أصبح التسمم الغذائي مشكلة صحية عامة متنامية في جميع أنحاء العالم، سواء في البلدان المتقدمة أو النامية. في البلدان النامية، قد يؤدي ضعف المعرفة حول التعامل مع الأغذية وسلامتها ونظافتها إلى أمراض منقولة عن طريق الأغذية.
الهدف: تقييم المعرفة والمواقف والممارسات المتعلقة بوعي سلامة الأغذية بين عامة الناس في ليبيا.
المواد والطرق: أجريت دراسة مقطعية على عينة عشوائية من مائة شخص بالغ (ذكور و إناث) يعانون من أعراض التسمم الغذائي (قيمة $p = 0.020$) من عامة الناس في طرابلس. كانت فترة الدراسة من سبتمبر 2022 إلى نوفمبر 2023. أجريت الدراسة باستخدام استبيان وجهاً لوجه باللغة العربية يتكون الاستبيان من جزأين: المعلومات الشخصية والمعرفة والموقف وممارسة سلامة الغذاء. تم إجراء تحليل البيانات باستخدام الحزمة الإحصائية للعلوم الاجتماعية (SPSS)، الإصدار 24.0. تم إجراء إحصاءات وصفية لتحديد المتوسطات والنسب المئوية والانحرافات المعيارية والترددات. تم استخدام اختبار مربع كاي ($X2$) لتحديد ارتباط المعرفة والممارسات بالتركيبة السكانية.
النتائج: وجدت دراستنا أن المشاركين تتراوح أعمارهم بين 18 و 35 عامًا (65.0٪). كان معظم المستجيبين من الذكور (75٪). كان لدى 43.0٪ من المشاركين درجة جامعية، وهي الأغلبية. من أصل 100 مشارك، 75 بالمائة كان لديهم وعي كبير بالتسمم الغذائي، وشعر 43% منهم بتقلصات في البطن، وهي مؤشرات على التسمم الغذائي. وكان لدى غالبية المستجيبين مستويات دخل متوسطة، حيث بلغت نسبتهم 69.0%. ومع ذلك، كان هناك فرق كبير في المعرفة والموقف والممارسة حول التسمم الغذائي (القيم الاحتمالية = 0.003، 0.004، 0.041، و0.048، على التوالي)، فضلاً عن وجود ارتباط كبير بين المستوى التعليمي وفهم أعراض التسمم الغذائي (القيمة الاحتمالية = 0.020).

الكلمات المفتاحية: المعرفة، الموقف، الممارسة، التسمم الغذائي.

Introduction

controlling blood pressure, pH, and salinity—all vital elements of body fluids that need to be kept in balance for optimal operation. Dialysis, a lifeline for many patients with renal failure, usually becomes necessary when kidney function drops to less than 15% of a healthy kidney's capability. When treatment stops, people who have been receiving dialysis for six months or more only live an average of ten days. The two primary treatments are hemodialysis and peritoneal dialysis; hemodialysis is the preferred treatment option for about 90% of individuals with kidney disease [1].

Protein-calorie malnutrition in chronic kidney disease (CKD) encompasses various metabolic and nutritional challenges caused by advanced renal disease and renal replacement therapies, commonly used in chronic hemodialysis patients. Protein-energy wasting significantly increases hospital admissions and mortality rates among dialysis patients. According to the latest Renal Data System Annual Report, over 600,000 individuals in the United States are currently receiving treatment for end-stage renal disease (ESRD), with 468,000 undergoing hemodialysis. The incidence of ESRD is expected to rise by 5% annually in the United States [2].

One of the main causes of the morbidity and mortality linked to CKD is malnutrition. One of the most important indicators of poor outcomes for hemodialysis patients is the level of protein-calorie malnutrition. As a result, giving patients enough calories and protein through supplements has emerged as a crucial medical intervention. Comprehensive approaches that address both protein and energy shortages while halting further depletion are necessary for the proper management of protein-calorie malnutrition. Comprehensive monthly measurements of serum albumin, dry weight, and general subjective evaluations at 3- to 6-month intervals should all be included in nutritional studies [3].

Protein-energy malnutrition affects 10% to 70% of patients with ESRD. Among hemodialysis patients, approximately 25% have energy expenditures less than 75% of their required dietary energy intake. Clinical symptoms become apparent only after malnutrition progresses to severe stages [3]. Nutritional status significantly impacts quality of life, making prompt improvement and accurate evaluation essential for effective nutritional therapy [3, 4].

1.1 Nutritional Status of Hemodialysis Patients

Malnutrition is a risk factor for ESRD patients on maintenance hemodialysis, according to several cross-sectional studies conducted globally. Longitudinal research shows malnutrition is associated with reduced life expectancy, primarily due to cardiovascular and infectious complications. Factors contributing to malnutrition include reduced protein-energy intake, dietary restrictions, anorexia, altered taste, chronic inflammation, and nutrient losses during dialysis [4, 5, 6]. Persistent catabolic states may result from acidosis, resistance to anabolic factors such as growth

hormone and insulin, and the biocompatibility of dialysis membranes and fluids. Close monitoring of dietary intake is also critical for predialysis patients.

1.2 Nutritional Management of Malnutrition in Hemodialysis Patients

For dialysis to remain stable, nutritional control is essential (Figure 1). Patients need to consume enough calories, protein, water, salt, potassium, and phosphorus [7].

Providing nutritional support helps prolong survival and enhance dialysis performance. However, patient adherence to dietary recommendations may be challenging due to factors such as limited family support, changing preferences, and lack of awareness [8, 9]. Long-term survival rates among hemodialysis patients strongly correlate with their nutritional status [10].

In hemodialysis patients, dialysis doses should be adjusted to correct acidosis and alleviate anorexia caused by the accumulation of uremic toxins. If malnutrition persists despite oral supplementation, aggressive therapeutic interventions—including parenteral nutrition—should be considered. Emerging treatments, such as recombinant growth hormone and insulin-like growth factor-1, demonstrate anabolic effects. New strategies for managing malnutrition may also include short daily dialysis sessions [6-10].

2. Aim of the Study

This study aims to assess the nutritional status of children with ESRD undergoing regular hemodialysis and to correlate caloric intake with anthropometric measurements.

3 Material and Methods

Study Design: This is a retrospective, descriptive cross-sectional study.

Study Setting: The study was conducted in the Nephrology and Dialysis Department at Tripoli University Hospital between January 2023 and August 2023.

Study Population: The study included 23 children, whose medical records from January 2023 to August 2023 were retrospectively reviewed.

Study Tools: Data were collected from medical records and through a customized questionnaire designed for the study, covering:

Demographic Characteristics: Age, gender, age at initiation of hemodialysis, underlying causes of renal disease, and duration of hemodialysis.

Nutritional Status:

Biochemical measurements: Serum albumin, hemoglobin, serum ferritin, urea, creatinine, sodium, potassium, calcium, phosphorus, and vitamin D.

Anthropometric measurements: Weight, height (expressed as standard deviation scores), mid-arm circumference (MAC), body mass index (BMI), and ideal weight-to-age ratio.

Nutritional intake: Protein and caloric intakes calculated as percentages of the recommended dietary allowances.

Data Analysis: Data were sorted, coded, and analyzed using SPSS software version 24.0. Descriptive statistics summarized the outcome variables, while inferential statistics determined significance at a 0.05 level.

Results and discussion

The study included 23 children with chronic renal failure, 11 boys (47.8%) and 12 girls (52.2%), undergoing regular hemodialysis. Age ranged from 1 to 14 years, with an average age of 10.5 years.73.9% had family history of hemodialysis, 95.7 % from the participants the duration of hemodialysis was 4 weeks and 73.9% from patients follow CKD as presented in table1.

Table (1): family history, duration of heamodialysis and follow CKD expressed as percentages.

Family History	**%**
Yes	73.9
No	26.1
Duration of hemodialysis	**%**
3/w	4.3%
4/w	95.7%
Follow CKD	**%**
Yes	26.1
No	73.9

Protein intake is alarmingly low across this population segment, with minimum values reported at just .9% and maximum values at .75%, which seem inconsistent and likely indicate data entry errors or misinterpretation since these percentages should logically be higher than those reported for caloric intake percentages if they are both expressed as percentages of RDA.A s shown in Table 2.

Table (2): The age at onset, duration, caloric and protein intake in children with CRF.

	Minimum	Maximum	Mean±SD
Age at onset of the disease (year)	3.4	13.5	7.5±1.72
Duration of the disease (years)	0.9	5.6	2.9±1.34
Caloric intake % of RDA of calories.	70.0	56.10	91.75±14.50
Proteins intake % of RDA of calories	9.60	75.00	139.23±23.07

Table 3 presents the clinical and laboratory characteristics of children with CKD. The minimum albumin value was 3.0 mg/dl and the maximum value was 7.1 mg/dl. Patients' creatinine levels ranged from 2.8 to 11.0, with a mean of 6.71 and mean phosphorus levels of 5.080 mg/dl and 2.20 to 7.50 mg/dl. Eventually, the patient's sodium concentration ranged from 129 to 142 mg/dl.

Table (3) : Clinical and laboratory characteristics of Libyan children with CRF.

Type of investigation	Mean	**95% CI**		Minimum	Maximum
		Lower	Upper		
albumin	4.365	4.001	4.730	3.0	7.1
Creatinine	6.717	5.765	7.670	2.8	11.0
Phosphorus	5.0804	4.5437	5.6172	2.20	7.50
Na	137.00	135.80	138.20	129	142
K	4.791	4.549	5.034	3.7	5.9

In Table4, Showed the relationship between disease duration, food intake and anthropometric measurements. The results showed that height was the most affected, as 83.3% of patients were short (z-height < -2) and z-height ranged from -0.6 to -7.1 with a mean of -3.66. showed. It is shown to be a measured parameter. In addition, the mean upper-to-lower body ratio was 1.1 and the mean arm span to height ratio was 1, indicating proportional short stature in CKD. Weight is less affected than height, as 46.7% of patients have a z-score for weight less than -2, with an average of -1.98. Mean z-scores for mean humeral circumference, triceps, and subscapular subcutaneous fat thickness decreased slightly. BMI and average upper arm circumference. Furthermore, a highly significant correlation was found between disease duration, height and weight (Table 4).

Table (4): Correlations between disease duration, food intake, and anthropometric measurements in children with CKD.

	Duration of disease	Caloric intake	Protein intake
Ht z-score	-.632**	.367*	-0.23
Wt z-score	-.495*	0.683*	-0.3
BMI z-score	0.128	0.404	-0.27
Mid upper arm circumference z-score	-0.052	0.573*	-0.3
Triceps skin fold thickness z-score	0.246	0.187	-0.28
Subscapular skin fold thickness z-score	0.37	0.176	-0.22

Table (5): Correlations between age and anthropometric measurements in children with CRF.

Age with Anthro. Measurements	Pearson Correlation	Sig. (2-tailed)
weight	.556**	0.006
Height	.463*	0.026
Mid arm circumference	0.258	0.235
BMI	0.275	0.205
IBW	.852**	0.000
Ideal height to age	.795**	0.000

In Table 5 &6, protein intake was significantly positively correlated with BUN, significantly negatively correlated with serum bicarbonate levels, and serum albumin and phosphate levels were significantly positively correlated with duration of hemodialysis, respectively. There was a correlation (p-value = 0.044, 0.043).

Table (6): Relationship between duration of hemodialysis with amount of pro., albumin, creatinine in Libyan children with CRF.

D. of H. with albumin & phosphorous		Sum of Squares	df	Mean Square	F	Sig.
albumin	Between Groups	2.794	1	2.794	4.570	.044
	Within Groups	12.838	21	.611		
	Total	15.632	22			
phosphorus	Between Groups	11.962	1	11.962	2.650	0.043
	Within Groups	94.791	21	4.514		
	Total	106.753	22			

The present work demonstrates that height is the most severely affected anthropometric parameter in children with CRF on dialysis. Our results agree with those of another Egyptian study done on 23 Libyan children with CRF on conservative treatment with an age range of 1-14 years which reported that the mean height z- score was -3.7 in Libyan children with CRF. On the other hand, data from developed countries generally show less severe height affection. The data on growth of 2,329 children in the North American Pediatric Renal Transplant Cooperative Study (NAPRTCS), showed that 36.6%, 47.0%, and 43.0% of children with chronic renal insufficiency (CRI), dialysis, and transplantation, respectively, have short stature, and the mean height z- score were -2.54, -1.95, and -1.67 for children aged 0 to 1 years, 2 to 5 years and 6 to 12 years, respectively (17).

Related to the clinical and laboratory characteristics of children with CKD. The minimum albumin value was 3.0 mg/dl and the maximum value was 7.1 mg/dl. Patients' creatinine levels ranged from 2.8 to 11.0, with a mean of 6.71 and mean phosphorus levels of 5.080mg/dl and 2.20 to 7.50 mg/dl. Eventually, the patient's sodium concentration ranged from 129 to 142 mg/dl.

In this study, the average upper-to-lower body ratio was found to be 1.1, while the average arm span-to-height ratio was 1. These measurements indicate proportional short stature in children with CKD. This aligns with findings from a previous study that reported children with severe developmental delays caused by CRF retained normal body proportions despite their condition (18).

However, another study highlighted that CKD patients exhibited a lower trunk-to-limb length ratio, suggesting a disproportionate impact of the disease or its treatment on spinal growth (19). In the current study, weight was less significantly affected than height, which is consistent with findings from other research showing no substantial weight loss in children with CKD (20).

Additionally, the mean brachial circumference z-score and subscapular skin fold thickness were slightly reduced. Mild to moderate deficits in triceps skin fold thickness have also been reported in children with CKD (21).

The current study found that the majority of children under 90% of age and gender criteria had below normal weight, arm circumference, and triceps subcutaneous fat thickness (Table 1). This is in partial agreement with Zaki et al. (2012) found that height was the most affected anthropometric parameter in CKD children on dialysis, whereas weight was less affected (26). Further, the North American Pediatric Kidney Transplant Cooperative Study (NAPRTCS) found that 36.6%, 47.0%, and 43.0% of children with chronic kidney disease (CRI), dialysis, or a transplant are short (32).

Both the mean upper-to-lower body ratio and the mean arm span-to-height ratio in the current study showed that short stature in CKD is proportional. This is in line with another study that found that even her severely CKD-related stunted children maintained proper body shape. In contrast, another study found that CKD patients had a lower trunk-to-limb ratio. This may indicate that a disease or treatment has a disproportionate impact on spine growth. In current research, weight is less important than height. This is consistent with other studies that have not shown a significant reduction in body weight in children with CH. In addition, there was a slight decrease in subscapular subcutaneous fat width and mean brachial circumference Z-score for triceps brachial. Children with CKD have been found to have mild to moderate impairments in triceps skin fold thickness (20),19. Clinical practice guidelines for nutrition in chronic renal failure published by the Kidney Disease Outcome Quality Initiative (K/DOQI) emphasize that no single index can provide a complete picture of nutritional status. As a result, a wide range of interventions are suggested and medical staff combine the results to provide an insightful analysis of nutritional status. Since there is no evidence that children requiring dialysis require higher RDAs than healthy children, the initial prescribed energy intake for children receiving hemodialysis or maintenance

peritoneal dialysis therapy should be within the chronological age recommendation of 1. It must be at the level of the Daily Allowance (RDA) (12).

Adjustments should then be made based on the child's reaction. Secondary causes of inadequate food intake in children with chronic kidney disease include anorexia, altered taste, nausea, vomiting, emotional distress, underlying medical conditions, unappealing prescription diets, and diets due to socioeconomic status. There are restrictions. In the current study, patient caloric intake ranged from 56-70% of their RDA, with an average of 91.7%. Only 23.3% of patients had adequate energy intake above 100% of their Recommended Daily Allowance, while the rest (76.7%) of patients had 100% of their Recommended Daily Allowance. had a calorie intake greater than 70% of the recommended daily allowance, despite being less than 96.7% of people ate enough protein and exceeded the 100% RDA, while the remaining 3.3% consumed less protein than recommended. nutrition, and the prevention of chronic non-communicable diseases, diets should be changed compared to nutrition in healthy children (23).

Conclusion

Early diagnosis and optimal treatment of malnutrition are the main objectives of this study, which requires frequent monitoring of all physical and biochemical markers and comprehensive evaluation of all indicators. May be misleading. Therefore, nutritional assessment should be based on multiple methods, the results of which should be synthesized by a pediatric nephrology team to comprehensively assess how dialysis start date is associated with lower anthropometric measurements and lower school performance. must be evaluated objectively.

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