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Original Article

Nutritional status among paediatric age group with chronic Renal failure undergoing hemodialysis.

Amal R. Agila[1*] and Ambarka Eid.H Kreim[2*]
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[1*] Department of Biochemistry, Faculty of Medicine, Derna University, Derna, Libya. Email:
[2*]Department of Nutrition, Faculty of Public Health, Benghazi University, Department of Public Health, Faculty of Medical Technology, Tripoli University, Tripoli, Libya.
Email: Ambarkakreim@gmail.com.
Corresponding Author*: Amal R. Agila amal_agela@yahoo.com.

Abstract

Objective was to evaluate the nutritional status of 23 children with chronic kidney disease receiving hemodialysis. Methodology: A structured interview questionnaire was designed and used to interview the child or mother. It includes nutritional assessment of the children under study, such as physical examination, anthropometric measurements, and laboratory investigations. Results: The current study found that11 boys (47.8%) and 12 girls (52.2%), undergoing regular hemodialysis. Age ranged from 1 to 14 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 and the majority of children under 90% of age and gender criteria had below normal weight, arm circumference, and triceps subcutaneous fat thickness and the average upper-to-lower body ratio was 1.1 and the average arm span-to-height ratio was 1, indicating proportional short stature in CKD Related to the clinical and laboratory characteristics of children with CKD. protein intake was significantly positively correlated with BUN, significantly negatively correlated with serum bicarbonate levels, the minimum albumin value was 3.0 mg/dl, and the maximum value was 7.1 mg/dl. Conclusion: In conclusion the age ranged from 1- 14 years,73.9% of patients follow CKD and many children (90%) of children had below normal weight and the average albumin value was 3.0-7.1 mg/dl. 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 with improving parental knowledge of nutritional dialysis is important.

KEYWORDS: nutritional assessment, children, hemodialysis, Tripoli.

1.INTRODUCTION

Patients starting dialysis have many benefits. First, dialysis acts as a second kidney, regulating blood pH, salinity, and blood pressure. These are all essential components of body fluids and must be kept in balance for the body to function properly. It is often tested when kidney function drops below 15% of that of a healthy kidney. This is because it is a lifeline for many renal failure patients. It is surprising to learn that people who have been on dialysis for 6 months or more and then stop only live an average of 10 days. Hemodialysis and peritoneal dialysis are two different procedures. Nearly 90% of kidney disease patients receive hemodialysis, which is used by most patients (1).

Protein-calorie malnutrition in chronic kidney disease is a term used to describe the various metabolic and nutritional problems caused by advanced renal disease and renal replacement therapy, which are commonly used in patients undergoing chronic hemodialysis. Protein energy wastage due to kidney disease has a significant impact on increased hospital admissions and mortality in dialysis patients. More than 600,000 people in the United States are currently being treated for end-stage renal disease, according to the latest Renal Data System Annual Report. Of these, 468,000 are on hemodialysis. End-stage renal disease is expected to increase by 5% each year in the United States (2).

Malnutrition in this patient group is the most responsible for its alarming morbidity and mortality. The degree of protein-calorie malnutrition is an important predictor of adverse outcomes in hemodialysis patients. Because of the magnitude of this problem, supplementing patients with adequate amounts of nutrients, including calories and protein, has inevitably become a step of choice for health professionals. is proven. Proper management of protein-calorie malnutrition involves a comprehensive combination of strategies that address both protein and energy malnutrition and take steps to prevent further depletion. Therefore, nutritional analysis should be detailed and should include monthly assessment of serum albumin, dry weight, and overall subjective assessment at 3- to 6-month intervals (3).Protein-energy malnutrition affects between 10% and 70% of patients with end-stage renal disease. In approximately 25% of hemodialysis patients, energy expenditure is less than 75% of the required dietary energy intake. Clinical symptoms appear only after malnutrition has progressed to a severe stage (3).

Because nutritional status affects a person's quality of life, it is imperative that the patient's nutritional status be rapidly improved in order to administer correct nutritional therapy. Accurate evaluation is important (3,4).

End-stage renal disease (ESRD) patients undergoing maintenance hemodialysis are at risk of malnutrition, as shown by several cross-sectional studies worldwide. Longitudinal studies have shown that malnutrition is associated with reduced life expectancy, primarily due to cardiovascular and infectious complications. Several factors contribute to malnutrition in hemodialysis patients. Protein energyintake is often reduced due to inappropriatedietary restriction, anorexia, and altered taste, leading to malnutrition in most dialysis patients. contribute to confusion (4). Persistent catabolic states can result from chronic inflammatory states caused by acidosis, resistance to anabolic factors such as growth hormone, insulin, insulin-like growth factor-1, and the biocompatibility of dialysis membranes and fluids. I have. Also, nutrients such as glucose, amino acids, proteins, and vitamins are lost during dialysis treatment. Close monitoring of dietary intake is also mandatory in predialysis patients (5,6).

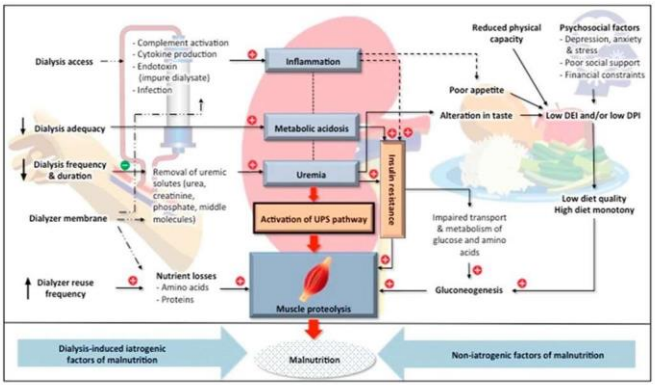

Figure 1: etiology of malnutrition in dialyzed patient.

Nutritional management is important to maintain dialysis stability (Figure 1). These patients need adequate intake of calories, protein, salt, sodium, potassium, phosphorus, and fluids.7 Providing nutritional support can help hemodialysis patients live longer and perform better on dialysis. However, it can also be stressful for the patient. Many factors, such as lack of family support, changing preferences, and ignorance, make changing eating habits difficult in real life. 8,9 It is known that the long-term survival of hemodialysis patients is greatly affected by nutritional status (10).

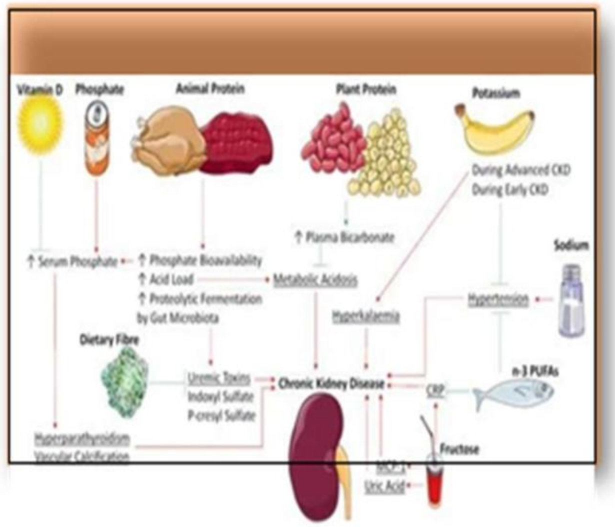

Figure2: management of malnutrition in hemodialyzed patients.

2-Patients and methods:

Study design:

retrospective, descriptive cross-sectional study.

Study setting:

This study was carried out in the Nephrology and Dialysis department at Tripoli University Hospital. Between January 2023 and August 2023.

Study period and population:

This study included 23 children who were retrospectively reviewed against the case records of the Department of Nephrology and Dialysis at Tripoli University Hospital from January 2023 and August 2023.

Study tool

The data was collected by reviewing medical records, by customized questionnaire has been created for the study's purposes which included the following**:**

1. Demographic characteristics: age, gender**,** age at the initiation of HD, underlying causes of renal disease, HD duration.

2. Nutritional status of the hemodialyzed patients was evaluated by using
   - A. Biochemical measurements: records were reviewed for serum albumin, hemoglobin percentage, serum ferritin, Urea, Creatinine, Na, K, Ca, phosphorus, and vitamin D.
   - B. Anthropometric measurements.
     - ➢ Weight and height were expressed in standard deviation score (SDS).
     - ➢ Mid Arm Circumference (MAC) in cm, BMI (percentile), IBW and Ideal height to age.
   - C-Nutritional information; protein and calories intakes were calculated and expressed as a percentage of the recommended dietary allowance of protein and calories for CHD as recommended.

Data analysis

The collected data were sorted, coded then entered and analyzed using the spss, version24.0 statistical software. Descriptive statistics were used to summarize the outcome variables. Appropriate inferential statistics were performed with 0.05 chosen level of significance.

Literature review

A review study by Lesley Rees & Vanessa Shaw in UK, 2007. It was about nutrition in children with CRF and on dialysis. It was amied to review the methods of assessing nutritional status & to review the dietary requirements of normal children throughout childhood, includingprotein, energy, vitamins and minerals. Results, rate of growth gradually decreases from >25 cm/year at birth to an average of 18 cm/year at age 1 year and 10 cm/year by the age of 2. Half of adult height is achieved by the age of 2 years, so that irrecoverable loss of growth potential can occur during this phase. At birth, 170 kcal/day are stored in new tissue, falling to 50–60 at 6 months, 30–40 by 1 year and 20–30 by the age of 2 years (13).

Study was conducted by Moushira Erfan Zaki & Mona Mamdouh Hassan et.al in Egypt, 2012. It was about nutritional Status in Children with Chronic Renal Failure on Hemodialysis. This study aimed to evaluate the growth in relation to nutritional status in Egyptian children with CRF on hemodialysis. Results: Data shows that height was the most affected anthropometric parameter. Short stature in CRF is proportionate and body weight is less affected than height. Dietary analysis showed that 76.7 % of patients had recommended dietary allowance of calories. Height z-score showed a significant positive correlation with caloric intake. On the other hand, the protein intake showed a significant positive correlation with blood urea nitrogen and a significant negative correlation with serum bicarbonate (16).

Study conducted by Hanan Abdulqaium et.al. this study was about nutrition assessment and management in children on peritoneal dialysis in Nephrology and dialysis unites in Tripoli University Hospital in Libya. This study aimed to discuss the main factors which affect the assessment and management of nutrition status in children on peritoneal dialysis. Results, the total peritoneal dialyzed children regarding total 20 patients from 1st January 2021 to 31 of December 2021 in children on regular peritoneal dialysis in Nephrology and dialysis unite in Tripoli University Hospital in Libya, 65% male and 35% female. the prevalence of the weight to age z score is 61.7 % >-2SD for male, 85.7% >-2SD for female and 70% >-2SD for total. Where result of blood analysis of children on peritoneal dialysis shows as in table the 65% low hemoglobin (anemic), 85% low vitamin D, albumin was low in 25%, 56%of patient's low vitamin B12, 95% high creatinine, and 85% high urea, free 75% high and Iron 75% normal (7).

Another study by Maryam Mohammad in Egypt,2020. It was about Assessment of Nutritional Status of Children with Chronic Renal Failure Undergoing Hemodialysis. It was aimed to assess the nutritional status of school age children with CRFunder going hemodialysis. Results revealed that many studied children had height, weight, BMI, MAC, TSFT less than normal. Many children were anemic. Most children were low in vitamins such as A (93.3%), C (93.3%) and D (100%). 63.3 % of the studied children had hypoalbuminemia. high percent of children had hypocalcemia and hypokalemia. All studied children had hypercreatinemia (17).

RESULTS

This 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 heamodialysis, 95.7 % from the participants the duration of hemodialysis was 4 weeks and 73.9% from patients follow CKD (table1 &2).

Table 1 presents the mean age and gender expressed as percentage.

Age	%	Sex	%
1-5 yr.	17.4	Male	47.4
5-10 yr.	8.7	Female	52.2
10-15 yr.	52.2		
15-20 yr.	21.7		

Table 2: 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

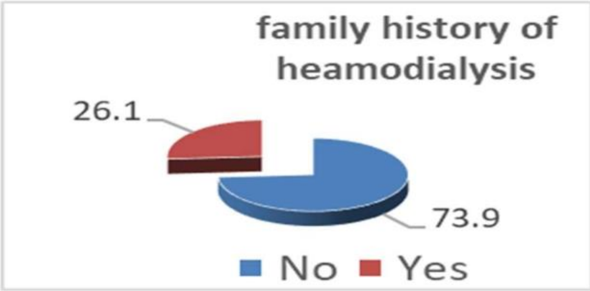

Figure3: Distribution of family history among Libyan children with CRF.

The mean of Age at onset of the disease was between 3.4-13.6 yr.) SD±M (7.5±1.72), Duration of the disease (.9-5.6 yr., SD±M 2.9±1.34), Caloric intake % of RDA of calories (56.2-70 %, SD±M91.75±14.50) and Proteins intake % of RDA of calories (9.60-75, SD±M139.23±23.07) (table 3).

Table 3: The age at onset, duration, caloric and protein intake in children with CRF.

	Minimum	Maximum	SD±Mean
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 4 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. ventually, the patient's sodium concentration ranged from 129 to 142 mg/dl.

Table 4: Clinical and laboratory characteristics of Libyan children with CRF.

Type of investigation	Mean	Minimum	Maximum
albumin	4.365	3.0	7.1
Creatinine	6.717	2.8	11.0
Phosphorus	5.0804	2.20	7.50
Hb	10.826	7.22	15.0
Na	137.00	129	142
K	4.791	3.7	5.9

In Table 5, 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.

Table5: Correlations between disease duration, food intake, and anthropometric measurements in children with CKD

Age with Anthropometric. 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

	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

In Table 6 & 7, protein intake was significantly positively correlated with Blood Urea Nitrogen (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: Correlations between age and anthropometric measurements in children with CR

Table 7: 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	Mean Square	F	Sig.
albumin	Between Groups	2.794	2.794	4.570	.044
	Within Groups	12.838	.611		
	Total	15.632			
phosphorus	Between Groups	11.962	11.962	2.650	0.043
	Within Groups	94.791	4.514		
	Total	106.753			

DISCUSSION

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 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 5.080 mg/dl and 2.20 to 7.50 mg/dl. Eventually, the patient's sodium concentration ranged from 129 to 142 mg/dl.

In the present study, the average upper-to-lower body ratio was 1.1 and the average arm span-to-height ratio was 1, indicating proportional short stature in CKD. This is consistent with another study that found that children with severe developmental delay due to CRF maintained normal physique despite the chronic condition (18). In contrast to another study, CKD patients had a lower trunk-to-limb length ratio, suggesting a disproportionate effect of disease and/or treatment on spine growth (19). In the current study, weight is less affected than height. This is consistent with other studies that found no significant weight loss in childrenwith CKD (20). The mean brachial girth z-scoreof the triceps brachial and the thickness of the subscapular skin fold were also slightly reduced. Mild to moderate deficits in triceps skin thickness have been reported in children with chronic kidney disease (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). Four). 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 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 (29). 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 bechanged compared to nutrition in healthychildren (23).

CONCLUSION

In conclusion, the age ranged from 1- 14 years,73.9% of patients follow CKD and the majority of children (90%) of children had below normal weight and the average albumin value was 3.0-7.1 mg/dl. 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 with improving parental knowledge of nutritional dialysis is important.

RECOMMENDATIONS

1-The 1-PKD Foundation gives specific

daily recommendations of 1.2 -1.4 g/day from protein.

2- potassium-restricted diet 40–120 mg/kg/day for infants and younger children and 30–40 mg/kg/day for older children.

3- folic acid and vitamin B12 should be to as part of a standard water-soluble vitamin supplement of pediatric dialysis patients.

4- Patients and their families should consult a dietitian when starting dialysis.

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ETHICS

Authors may need to address any ethical issues that may arise after the publication of this manuscript.

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