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Research Article

NUTRITIONAL ASSESSMENT OF CHILDREN AGED (7-18) YEARS WITH END STAGE RENAL DISEASE UNDERGOING HEMODIALYSIS (MOHAMED ALAMEN HAMED HOSPITAL)

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ABSTRACT

This study is cross-sectional descriptive hospital based-study to assess nutritional status and dietary intake for children with end stage renal disease out patients undergoing hemodialysis attended Mohamed Alamen Hamed Pediatric Hospital, Omdurman locality. During the period from November 2015 to February 2016. The study included 40 patients. Their ages range between (7-18) year's old. Data was collected by using questionnaire, food frequency questionnaire, 24-hour food recall and anthropometric measurements. The results reveals that 62.5% of patients were severe thinness and (27.5%) were thinness, 67.5% of the patients had inadequate protein intake, 87% of patients had inadequate energy intake, 85% of these children eat two meals per day and 70% had poor appetite and nausea. 75% of the patients did not obey the dietary advice. Significant relationship was found between BMI for age Z score with GIT problems and dietician advice or monitoring, P value (0.04, 0.03) respectively. The study concluded that most of the patients had inadequate energy and two third had inadequate protein intake and recommended that nutrition counseling should employ more innovative methods directed towards patients on maintenance hemodialysis (MHD) who suffer from both illiteracy/poor education and poverty.

INTRODUCTION

The main function of the kidney is to maintain homeostatic balance with respect to fluids electrolytes and organic solutes. The normal kidney can perform this function over a wide range of dietary fluctuations in sodium, water, and various solutes. This task is accomplished by the continuous filtration of blood and alterations in this filtered fluid. The kidney receives 20% of cardiac output, which allows the filtering of approximately 1600L/day of blood and 180L of fluid then the ability of kidney to excrete the daily load of waste. The manifestations of renal disease are direct consequences of the portion of the urinary tract system most affected, this manifestation include: Glomerular disease, acute renal failure, tubular defects, end stage renal failure, and renal stone (Kathleen and Sylvia, 2008). Chronic kidney disease (CKD) is clinical syndrome caused by progressive and irreversible loss of kidneys function. Its etiology varies with age. In new born and infant's malformation of the urinary tract is the predominant while in children and adolescents are prevalent glomerulopathies (Brenner and Rector, 2000). In children with chronic renal disease the protein- energy malnutrition is a common contribution to high rates of stunting. It has been found that there was some degree of malnutrition in 100% of patients followed (Kopple *et al*. 2000).

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Short stature is an important manifestation of malnutrition in the chronic kidney failure and occurs in about 50% of children who start dialysis. The severity of growth retardation is related to age of onset of renal failure, the creatinine clearance and the degree of malnutrition in these patients (Norman *et al*. 2000). Renal failure causes a state of metabolic unbalance proportional to the fall in renal function, with high enzyme levels responsible for the decrease in protein synthesis, change in carbohydrate tolerance, changes in water balance, electrolytes, acid-base balance, lipid metabolic and cellular energy production (National Kidney Foundation, 2008). Renal failure is treated by dialysis or transplantation of the kidney, the most common methods is hemodialysis in which blood passes by the semi permeable membrane of the artificial kidney and waste products are removed by diffusion and fluid by ultra-filtration. Hemodialysis usually requires treatment for 3-4 hours three time per week, but newer therapies are changing the time required (Kathleen and Sylvia, 2008). Vascular access available for Hemodialysis includes Arterio Venous Fistula (AVF), Arterio Venous Graft (AVG) and Central Venous Catheters (CVC). Since native AVF is regarded as the best access for Hemodialysis due to its high patency rate (Hakim and Himmel 1998) and lower mortality risk (Dhingra *et al*. 2001) it is always considered as first choice for hemodialysis patient and is preferred over AVG and CVC. The clinical practice guidelines for vascular access of national kidney foundation

dialysis outcome quality initiative recommended use of AV access for Hemodialysis over CVC (National Kidney Foundation, 2008). Dialysis is used in acute and chronic renal failure for short or long periods. It does not correct metabolic problems and there is need for modification of diet also as supplements. In hemodialysis, the patient's blood circulates outside the body through a semi permeable membrane bathed in dialyzing fluid and removes nitrogenous wastes from it also some serum amino acids and water soluble vitamins are lost in the dialysate. Between dialysis, dietary control helps to maintain acceptable levels of nitrogenous waste products, Potassium, sodium and fluids in the blood. The diet of patient on dialysis is an important aspect of maintaining biochemical control several basic objectives of each individual was conducted to maintain protein, caloric balance –normal, potassium and sodium, acceptable serum phosphate and calcium level and to prevent dehydration or fluid over load (Sue,1995).

Justification

Information that is available about the impact of hemodialysis on nutritional status in children with end-stage renal disease in Sudan, is very little compared to other countries. No previous published study assessed the nutritional status of children with end stage renal disease on Maintenance Hemodialysis in Sudan. This drew attention of the researcher to conduct study on outpatient's children with end-stage renal disease aged 7-18 years at Mohamed Alamen Hamed pediatric Hospital, Omdurman state.

Problem statement

Growth failure is significant problems in pediatric patients with chronic kidney disease. There are different factors contributing to impairment of linear growth failure. Dietary management of children with end stage renal disease is very important in controlling the disease, because children need special nutrition care.

General objective

To assess the nutritional status and dietary intake of outpatients children on dialysis who admitted to Mohamed Alamen Hamed Pediatric Hospital in Omdurman state.

Specific objectives

- To determine the prevalence of undernutrition among hemodialysis patients using anthropometric measurement.
- To assess energy intake of patients.
- To assess protein intake of patients.
- To measure protein quality of patients.

MATERIALS AND METHODS

Study design

Cross sectional descriptive case finding hospital based study, was carried out in Mohamed Alamen Hamed Pediatric Hospital in Omdurman state.

Total sample was selected using the convenience type of sampling included 40 children outpatients undergoing hemodialysis during the period of data collection. The respondents were selected according to the following criteria:

- Consent to participate in this study.
- 7 -18 years old.
- Both genders.
- The patients were receiving regular hemodialysis at Mohamed Alamen Hamed Hospital for at least 3 months. Patients had no acute illness, such as hepatitis.

Primary data was collected by using a specifically structured questionnaire about demographic data, clinical data, dietary intake, hospital diet, and 24 hours recall for one previous dialysis's day was involved interview to:

- Parent's proxy for children 7-10 years.
- Children from 10-18 years old.

Anthropometric measures for children aged 7-18 years old was conducted using scale meter for weight and Heights also height –for -age and BMI –for age Z score (WHO, 2007).

RESULTS

Patients' socioeconomic background

Table (1) shows that (52.5%) of patients were males and (47.5%) were females. Their age distribution is as follows: (52.5%) were at the age group15-18. (40%) at the age group 11-14 and (7.5%) their age were less than 10 years old, (87.5%) had primary education, (5%) were illiterate, and (7.5%) had secondary education. As for patients' father education, 45% had primary education, (35%) were illiterate, (12.5%) had secondary education and (7.5%) had university education. Regarding their mothers, (47%) had primary education, (42.5%) were illiterate and 10% had secondary education

The results also show that 77.5% of their fathers were self-employed, (15%) unemployed and (7.5%) employed. Eighty percent of participants' mothers were housewives and (20%) self-employed. Regarding income, 92.5% had low income and (7.5%) had medium income. All the patients had end stage renal disease undergoing hemodialysis more than three months. The result shows 50% had renal disease before ESRD for 1-4 years, (30%) for 5-9 years (15%) for less than one year and only (5%) for more than 10 years. Length of dialysis was (32.5%f) or less than one year, (25%) for 1-2 years, (30%) for 3-4 years, (7%) for 5-6 years and (5%) for more than six years. The results also shows that 97.5% had 3 sessions/week and (2.5%) had 2 sessions. Duration of dialysis session was 3hours for 70% of the patients and, 2:30 hours for 30% of them. The results demonstrate 77.5% of patients' family did not have history of kidney disease, (20%) of grandfathers had disease while (2.5%) of their grandmothers had kidney disease. The major complications among the patients were hypertension (72.2%), cardiovascular disease (5%), and Diabetes Mellitus (2.5), while (20%) did not have chronic disease. Fifty percent of patients had poor appetite, (20%) had nausea, (12%) diarrhea, (10%) allergy and (7.5%) had constipation.

Table 1. Patients' socioeconomic background

Variables		Frequency	Percent
Gender	Male	21	52.5
	Female	19	47.5
	Total	40	100.0
Age	7-10	3	7.5
	11-14	16	40.0
	15-18	21	52.5
	Total	40	100.0
Numbers of family members	1 – 5	28	70
	6 – 10	12	30
	Total	40	100.0
Level of child education	Illiterate	2	5
	Primary	35	87.5
	Secondary	3	7.5
	Total	40	100.0
Level of mothers education	Illiterate	17	42.5
	Primary	19	47.5
	Secondary	4	10.0
	Total	40	100.0
Level of fathers education	Illiterate	14	35.0
	Primary	18	45.0
	Secondary	5	12.5
	University	3	7.5
	Total	40	100.0
Fathers occupation	Employed	3	7.5
	unemployed	6	15.0
	Self employed	31	77.5
	Total	40	100.0
Mothers occupation	Housewife	32	80.0
	Self employed	8	20.0
	Total	40	100.0
Average income	Low level	37	92.5
	Medium level	3	7.5
	Total	40	100.0

Table 2. Medical data

Variables		Frequency	Percent
History of disease	< 1 year	6	15.0
	1- 4 years	20	50.0
	5 - 9 years	12	30.0
	10 - 13 years	2	5.0
	Total	40	100.0
History of hemodialysis	< 1 year	13	32.5
	1 - 2 years	10	25.0
	3 - 4 years	12	30.0
	5 - 6 years	3	7.5
	> 6 years	2	5.0
	Total	40	100.0
Family history of the disease	Grandfather	8	20.0
	Grandmother	1	2.5
	Never	31	77.5
	Total	40	100.0
Dialysis session/week	2 times	1	2.5
	3 times	39	97.5
	Total	40	100.0
Duration of HD (hours)	2:30	12	30
	3	28	70
	Total	40	100
chronic disease	Hypertension(HTN)	29	72.2
	Diabetes mellitus(DM)	1	2.5
	Cardiovascular Disease(CVD)	2	5
	None	8	20
	Total	40	100
Gastrointestinal tract problem	Poor appetite	20	50
	Allergy	4	10
	Nausea	8	20
	Diarrhea	5	12.5
	Constipation	3	7.5
	Total	40	100

Table 3. Dietary data

Variables		Frequency	Percent
Received dietitian advice	Yes	23	57.5
	No	17	42.5
	Total	40	100.0
yed the instruction of the advisor	Yes	10	25.0
	No	30	75.0
	Total	40	100.0
Number of meals/day	Two meals	34.0	85.0
	Three meals	6	15.0
	Total	40	100.0
Time of the meals on dialysis day	Before/dialysis	4	10,0
	During/dialysis	28	70.0
	After/ dialysis	8	20.0
	Total	40	100.0
Average amount of water taken /day	< 6 cups	16	40.0
	> 6 cups	24	60.0
Source of diet in dialysis session	Hospital	15	37.5
	Market	15	37.5
	Home	10	25.5
	Total	40	100.0
Hospital diet acceptable	Yes	14	35.0
	No	26	65.0
	Total	40	100.0
Protein adequacy	Adequate	5	12.5
	Inadequate	27	67.5
	Excessive	8	20.0
	Total	40	100.0
Animal protein intake	Low intake	26	65.0
	High intake	14	35.0
	Total	40	100.0
Energy adequacy	Adequate	4	10.0
	Inadequate	35	87.5
	Excessive	1	7.5
	Total	40	100

Table 4. Nutritional status

Variables		Frequency	Percent
BMI for age z score	severe thinness	25	62.5
	Thinness	11	27.5
	Normal	4	10.0
	Total	40	100.0
Height for age	normal	15	37.5
	moderate stunted	15	37.5
	severe stunted	10	25.0
	Total	40	100.0

Table 5. Age, gender and BMI for age- z-score

BMIforAge	**Gender**	**Age**			
		7-10	11-14	15-18	Total
Severe thinness	Male	11.8 % (2)	41.2% (7)	47.0% (8)	17
	Female	12.5% (1)	62.5% (5)	25% (2)	8
	Total	3	12	10	25
thinness	Male	0	0%	100 % (2)	2
	Female	0	44.6% (4)	55.6% (5)	9
	Total	0	4	7	11
Normal	Male	0	0	100% (2)	2
	Female	0	0	100% (2)	2
	Total	0	0	4	4

P value=0.554

Table 6. Energy (kcal/day) and protein (g/day) intake adequacy and age

Age	Energy (Kcal/day)			
	Adequate	Inadequate	Excessive	Total
7-10 year	0% (0)	100% (3)	0% (0)	3
11-14years	0% (0)	93.7% (15)	6.3% (1)	16
15-18 years	19% (4)	81.0% (17)	0% (0)	21
Total	4	35	1	40
pvalue=0.254				
	protein intake adequacy			
age 7-10 years	33.3% (1)	33.3% (1)	33.3% (1)	3
11-14 years	18.7% (3)	62.5% (10)	18.7 (3)	16
15-18 years	4.8% (1)	76.2% (16)	I9% (4)	21
Total	(5)	(27)	(8)	40

P value =0.456

Table 7. Age and Animal protein intake

	Animal protein intake		
Age	Low intake	High intake	Total
7-10	33.3% (1)	66.7% (2)	3
11-14	62.5% (10)	37% (6)	16
15-18	71.4% (15)	28.6% (6)	21
Total	26	14	40

P value =0.417

Table 8. GIT problems and BMI for age-z score

BMI for age-z score	GIT problems					
	Poor appetite	Allergy	Nausea	Diarrhea	Constipation	Total
Severe thinness	60.0% (15)	8% (2)	16.0% (4)	4.0% (1)	12.0% (3)	100.0%
Thinness	36.4% (4)	18.2% (2)	18.2% (2)	27.3% (3)	0.0% (0)	100.0%
Normal	25.0% (1)	0.0%	50.0% (2)	25.0% (1)	0.0% (0)	100.0%

P. value 0.04

Table 9. Dietary advice and BMI for age-z score

Dietary Advice		BMI for age- z score			Total
		Severe thinness	Thinness	Normal	
	Yes	27.5% (11)	25% (10)	5% (2)	23
	No	35% (14)	2.5% (1)	5% (2)	17
	Total	35	11	4	40

P .value = 0.03

Table 10. Mean of energy and protein intake and requirement

	N	Minimum	Maximum	Mean	Std. Deviation
energy intake	40	324	1360	749.00	248.846
energy requirement	40	893	2400	1428.13	291.064
protein intake	40	10	73	34.11	14.896
protein requirement	40	25	78	40.67	11.616

Table (3) reveals that 57.5% of patients received dietary advice and 42.5% did not. Seventy five percentage of the patients did not obey the dietary advice while (25%) of them obeyed the dietary advice. Regarding numbers of meals taken per day, the study reveals 85% of the patients had two meals per day, 15% had three meals per day. On the other hand (70%) of the patients had their meals during dialyses, (20%) after dialyses and (10%) had their meal before dialysis. The Average amount of water taken by the patients were more than 6 cups by (60%) and less than 6 cups by (40%) of them. The results also demonstrated that (35%) of the patients consumed hospital diet, (35.5%) consumed diet from the markets and (25%) from home. As for the acceptance of the hospital diet, (65%) of the patients accepted diet provided by hospital while (35%) did not accept.

Dietary protein intake had inadequate by 67.5% of the patients, excessive intake was shown by (20%) and (12.5%) of them had an adequate protein intake. An inadequate energy consumption was shown by (87%) of the patients, (10%) had adequate energy intake while (7.5%) had excessive intake of energy. Table (4) Shows that (62.5%) of the patients were severe thinness, (27.5%) thinness and (10%) at the normal range. Regarding the height for age (37.5%) of the patients were normal, (37.5%) were moderate stunted while 25% showed severe stunted growth. Tables (5), demonstrates that, no significant relationship was found between; age, gender and BMI for age- Z score, P value= (0.554). No significant relationship was also detected between age with energy adequacy, protein adequacy and animal protein intake, P value= (0.254),(0.456) and (0.417) respectively(tables 6,7). (8) significant relationship was detected between GIT problems and BMI Z score P. Value 0.04.

Table (9) reveals, significant relationship was detected between dietary advice and BMI for age Z score P. value= (0.03).Table (10) shows that energy intake ranges between (324 -1360) kal/day with the mean of (749.00 2± 248.846) while the range of energy requirement was (893-2400) kcal/day with the mean of (1428.13 ± 291.064). The range of protein intake was (10-73) g/day with the mean of (34.11± 14.616) and the range of protein requirement was (25-78) g/day with the mean of (40.67±11.616).

DISCUSSION

This is cross-sectional descriptive hospital based-study to assess nutritional status and dietary intake of outpatient's children with end stage renal disease undergoing hemodialysis attended At Mohamed Alamen Hamed Pediatric Hospital. In this study male were more than female patients; male predominance among maintenance hemodialysis MDH patients similar result was reported by Axelsson, (2014). Most of patients had primary education, their fathers and mothers had low education. Most of them (92.5%) classified as low income group, this factor contributes to their low nutrition status. Similar results were previously reported by Perneger *et al*. (1995). Half of the patients had renal disease from 1 to 4 years and half of them had length of dialysis from1to 4 years as well. Most of the patient's families did not suffer from kidney diseases. Similar results were reported by Nagy *et al*. (2015). Three quarters of the patients had hypertension followed by diabetic mellitus then cardiovascular disease. Similar results were reported by Nagy *et al*. (2015). The results demonstrated Half of the patients received nutrition counseling but more than two third did not follow up the nutrition advice.

Most of patients took 2meals per day and 15% took 3 meals per day, most of them had their meal during dialysis session which confirms by previous study reported by Nagy *et al*. (2015). The hospital on dialysis day provides breakfast, lunch according to the patients session time, 35% of patients consumed hospital meals and 35.5%of them consumed from market, two third of patients did not accept hospital meals because it was devoid of salt and oil and their families wanted to improve their mood and reduce symptoms of anxiety so they provided food from the market. Similar result was obtained by Lotfy *et al*. (2015). Dietary intake was analyzed using two procedures adequacy of the dietary energy intake and protein intake as well as the quality of the protein consumed. Results had shown that a high proportion of the patients had inadequate energy intake, two third of patients had inadequate protein intake, which Were the signs of insufficient food intake due to patients' poor appetite and most of them had two meals which expected from those categorized as low socioeconomic status properly adjoining the border line of poverty which confirms previous study reported by Lotfy *et al*. (2015).

The results demonstrated more than half of patients had high of animal protein intake, their ages group between 7-10 years and more than half had low of animal protein intake their ages group between 11-14 years and two third of patients had low of animal protein intake their age group between 15-18 years, similar results were demonstrated by Nagy *et al*. (2015). Regarding nutrition status of the patients, 62.5% were severe thinness, (27.5%) thinness and (10%) were normal also (37.5%) were moderate stunted while 25% showed severe stunted and (37.5%) of the patients were normal, Most of the patients who suffered from severe thinness were males their age group between 15-18 years and most of the thinness were females, their age ranges between 15-18 years which was not in line with the pervious study conducted by Nagy *et al*. (2015)which revealed that nutritionist had a major role to play to adjust the weight of these patients. The study concluded that most of the patients had inadequate energy and two third had inadequate protein intake and recommended that nutrition counseling should employ more innovative methods directed towards patients on maintenance hemodialysis (MHD) who suffer from both illiteracy/poor education and poverty.

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