Journal of Communicable Diseases
Volume 54, Issue 1 - 2022, Pg. No. 107-116
Peer Reviewed & Open Access Journal

Research Article

Assessment of Nutritional Status of Children with CKD on Maintenance Haemodialysis in Baghdad City

Manar A Mehdi[1], Yossra Khalaf Hanoon[2]

[1]Ministry of Health, Baghdad, Iraq.
[2]Department of Family and Community Medicine, College of Medicine, Al-mustansiriya University.
DOI: https://doi.org/10.24321/0019.5138.202257

INFO

Corresponding Author:
Yossra Khalaf Hanoon, Department of Family and Community Medicine, College of Medicine, Al-mustansiriya University.
E-mail Id:
yossraalrobaiaay@gmail.com
Orcid Id:
https://orcid.org/0000-0002-2615-1566
How to cite this article:
Mehdi MA, Hanoon YK. Assessment of Nutritional Status of Children with CKD on Maintenance Haemodialysis in Baghdad city. J Commun Dis. 2022;54(1):107-116.

Date of Submission: 2022-01-25
Date of Acceptance: 2022-03-28

ABSTRACT

Background: Chronic kidney disease is a worldwide major public health problem. Most of the data related to the epidemiology of this condition during childhood focuses on the severe and late stages of renal impairment which is associated with malnutrition. It is an influential problem among those children and is essential to be recognised as early as possible.

Objectives: To assess the nutritional status of children with chronic kidney disease on haemodialysis using anthropometric measurements.

Patients and Method: A cross-sectional study was conducted in three randomly selected dialysis centres in Baghdad, the capital of Iraq, on a sample of patients with chronic kidney disease who attended these dialysis centres. Direct interviews were used to collect data during the period of the study which extended from the 15th of January to the 15th of July 2019.

Results: This study enrolled 140 children. The mean age of the respondents was 9.9 ± 3.6 years and 42.9% of them had an age range of 10-14 years. 57.1% of the study sample was diagnosed with the disease since 5-9 years, and 42.1% were on HD for 12-23 months. 37.1% of the sample were thin for age according to their gender, and 72.2% of them were stunted and severely stunted. Conclusions:A considerable proportion (75%) of children with chronic kidney disease were undernourished, with a significant percentage of the study sample detected with chronic malnutrition (stunted and severely stunted).

Keywords: Haemodialysis, CKD, Baghdad, Body Mass Index, Kidney

Introduction

Chronic kidney disease (CKD) is defined as damage to the kidney or the glomerular filtration rate (GFR) < 60ml/min/1.73m² for three months or more, regardless of the underlying aetiology. Also, CKD can be defined as irreversible damage to the kidney that can progress to end-stage renal disease (ESRD); it is a worldwide major public health problem. Most of the data related to the epidemiology of CKD during childhood focuses on the severe and late stages of renal impairment.[1]

The incidences of an early stage of CKD among children at earlier stages (non-dialysis) are hard to identify because many of the children are not referred to a nephrologist or tracked at earlier stages. However, the total number of paediatric CKD population is much higher than the reported number for end-stage kidney disease (ESKD). The clinicians could work with renal non-ESKD populations, such as children with genetic and metabolic disorders that present at birth or are manifested during childhood.[2]

The consequences of CKD during childhood can affect the nutrition state as well as decrease the growth rate. The wasting of protein-energy occurred due to hormonal and metabolic disturbance as well as nourishing complications is correlated with increased morbidity and mortality rate in children with CKD.[3]

The acute disease mostly affects weight, while the chronic disease affects linear growth. According to the clinical parameters that are used to describe malnutrition, a prevalence of 20-45% of children with CKD has been reported in many studies.[4]

Stunting is a sign of growth failure which is defined as the length or the stature below the minimum cutoff for age, which equals the fifth percentile of the normal growth. Itis a systemic dysfunction during the physical development of the children and is considered a sign of chronic malnutrition and often results in delayed mental development, poor school performance, and reduced intellectual capacity.[5]

Patients and Method

Study Sample

The present cross-sectional study included samples of 140 patients (78 male and 62 female). All the children with CKD who attended the three randomly selected dialysis units in Baghdad during the period of the study (15 January 2019 to 15 July 2019), were available on the data collection days and fulfilled the inclusion criteria, were included in this study on a consecutive base.

Inclusion Criteria

- Patients diagnosed as cases of CKD as confirmed by laboratory investigations at least six months before and undergoing maintenance haemodialysis
- Aged between 2 and 18 years
- Patients whose parents were willing to enrol their child in the study

Any patient who was not fulfilling the above-mentioned criteria was automatically excluded from the study.

Study Tool

The data were collected by direct interview with the parents of the participants; the interview was done using a structured questionnaire designed by the researchers and approved by the Scientific Committee in the Family and Community Medicine Department in AL- Mustansiryah College of Medicine. The questionnaire encompassed two parts:

Part One

This part of the questionnaire comprised questions regarding the socio-demographic information and some disease characteristics which include:

Socio-demographic Information

Age (years), Gender, Rank of the child in the family, Mother's age, Mother's employment, Mother's level of education, Father's age, Father's employment, and Father's level of education.

Characteristics related to the Disease

History of CKD: Cause of disease, Age of diagnosis, Duration of haemodialysis (years), Frequency of haemodialysis (time/ week), Medical history, Surgical history, Family history of the same condition, and Drug history.

Part Two

This part included anthropometric measurements.

Weight: Dry weight was taken after haemodialysis.Each patient was weighted barefooted with light clothes while standing, on the centreof the beam balance weighing scale. The scale was checked every day before weighing by using standard weights.[6]

Height (cm): The height was measuredby using a rigid upright standwith a T piece or a stadiometer.[7]

Body Mass Index (BMI): It was calculated as the ratio of weight (kg) divided by the height squared (in metric unit).[8]

$$BMI = \frac{Weight\ (Kg)}{Height\ (m^2)}$$

The definitions used for the study were as follows:[9]

- **Normal:** BMI for age z-score of less +1SD to less -2SD
- **Overweight:** BMI for age z-score of > +1SD
- **Obesity:** BMI for age z-score of > +2SD
- **Thinness:** BMI for age z-score of <−2SD
- **Severe thinness:** BMI for age z-score of <−3SD

Height-for-age: Children are defined as stunted if their height-for-age is more than two standard deviations below the WHO Child Growth Standards median. Children were categorised as stunted according to the definitions used for the study, which are mentioned below:

Severely stunted: Children whose height-for-age z-score is below minus 3 (-3.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc70 < -300).

Moderately or severely stunted: Children whose height-for-age z-score is below minus 2 (-2.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc70 < -200).

Mean z-score for height-for-age: Sum of the z-scores of children with a non-flagged height for age score (∑ hc70/100, if hc70 < 9990).[10]

Data Collection

The data werecollected by direct interviews with the parents of children on haemodialysis; two visits/week were performed during the working hours of these centres according to the schedule made for the patients on specific days.

Ethical Approval and Permission

The parentswere informed about the purpose of the study, significant and verbal consent were taken from all parents who were recruited forthe study. Confidentiality of the obtained information was taken care of.

An official letter of permission from the Scientific Board of Family Medicine of the Iraqi Council for Medical Specialization was obtained.

Permission to carry out the study was acquired from Baghdad, Al-Karkh andAl-Russafa Health Directorates.

Results

This study enrolled 140 children with CKD. The mean age of the respondents was 9.9±3.6 years and 42.9% (60) had an age range of 10-14 years. 55.7% (78) were males and 35.7% (50) of them ranked second in the family.Eighty respondents (57.1%) had beendiagnosed with CKD since 5-9 years, 59 (42.1%) were on HD for 12-23 months, 106(75.7%) were undergoing haemodialysis twice per week, and regarding the cause of the disease,for 29.3% of the cases of CKD, it was nephrotic syndrome as shown in Table 1.

Table 1.Distribution of the Study Sample according to their Demographic Characteristics and Disease Characteristics

Variables		No.	%
Age (years)	1-4	8	5.7
	5-9	57	40.7
	10-14	60	42.9
	15-18	15	10.7
	Mean± SD (Range)	9.9±3.6 (2.8-17.5)	
Gender	Male	78	55.7
	Female	62	44.3
Rank	First	45	32.1
	Second	50	35.7
	Third	34	24.3
	Fourth & more	11	7.9
Age of diagnosis with CKD (years)	1-4	30	21.4
	5-9	80	57.1
	10-14	30	21.4
	Mean±SD (Range)	7.1±2.8 (2-14)	
Duration of HD (months)	<12	33	23.6
	12-23	59	42.1
	24-35	37	26.4
	≥ 36	11	7.9
	Mean±SD (Range)	16.9±8.7 (7-48)	
Frequency of HD (time/week)	One	17	12.1
	Two	106	75.7
	Three	13	9.3
	Four	4	2.9
Cause of disease	Prolonged UT obstruction	39	27.9
	Nephrotic syndrome	41	29.3
	Polycystic kidney disease	15	10.7
	Cystinosis	13	9.3
	Unknown cause	32	22.8

The mean age of the mothers was 33.46±4.6 years. 41 (29.3%) mothers were employed and 51 (36.4%) were illiterate. Regarding fathers, the mean age was 37.6±5.5 years. 52(37.1%) fathers were employed and 42 (30%) were illiterate.

Concerning the medical history of the respondents, 32% of them were hypertensive and only 3.6% were diabetic. 8.6% had undergone renal transplantation and more than half of the sample had a negative family history of the same condition, as shown in Table 2.

There were 37.1% of patients with z-scores of < 1, indicating that they were wasted according to their age and gender and the remaining 62.9% had normal BMI for age, as illustrated in Figure 1.

Regarding the height for age of the respondents according to their gender, 34.3% of them were severely stunted, 37.9% were with stunting, and 27.9% of the studied sample had a normal height for their age, as illustrated in Figure 2.

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202257

Table 2.Distribution of the Study Sample according to Socio-demographic Characteristics of their Parents, and their Medical, Surgical and Family History

(N =140)

Variables		No.	%
Mother's age (years)	20-29	17	12.1
	30-39	104	74.3
	40-49	19	13.6
	Mean±SD (Range)	33.6±4.6 (22-45)	
Father's age (years)	20-29	5	3.6
	30-39	81	57.9
	40-49	47	33.6
	50-59	7	5.0
	Mean±SD (Range)	37.6±5.5 (25-55)	
Mother's employment status	Employed	41	29.3
	Unemployed	99	70.7
Father's employment status	Employed	52	37.1
	Unemployed	88	62.9
Mother's educational status	Illiterate	51	36.4
	Primary	35	25.0
	Secondary	47	33.6
	College & higher	7	5.0
Father's educational status	Illiterate	42	30.0
	Primary	31	22.1
	Secondary	59	42.1
	College & higher	8	5.7
Medical history	Hypertension	45	32.1
	Diabetes Mellitus	5	3.6
	No	90	64.3
Surgical history	Renal transplant	12	8.6
	Appendectomy	2	1.4
	Tonsillectomy	2	1.4
	No	124	88.6
Family history of the same condition (ESRD)	Yes	63	45.0
	No	77	55.0
	Mean ± SD (Range)	37.6± 5.5 (25-55)	

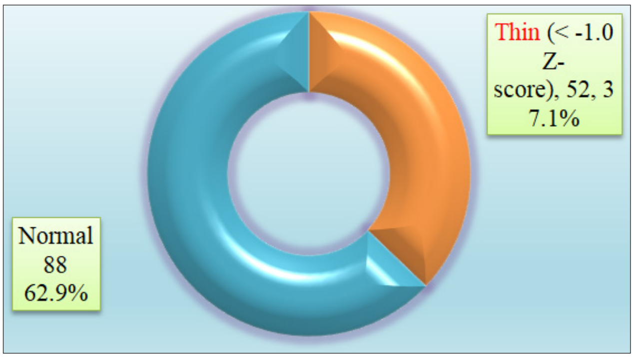

Figure 1.Distribution of the Study Sample according to BMI for their Age

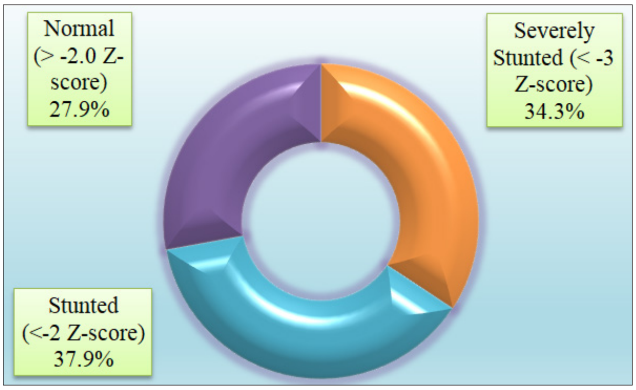

Figure 2.Distribution of the Study Sample according to their Height for Age

There was a statistically significant association between age and BMI for age, as in thin patients, there were 13.5% aged 1-4 years and 36.5% aged 10-14 years, while in normal/ overweight patients, only 1.1% had an age range of 1-4 years, and 46.6% were aged 5-9 years. The child's gender and his rank in the family were not associated with being wasted, as shown in Table 3.

The age group of 1-4 years had13.5% of the wasted patients, while the age group of 10-14 years represented36.5% of them.There was a significant statistical association between the patient's age and being thin.

61.5% of the thin patients were male and there was no significant statistical association between BMI for age with gender and the child rank in the family.

There was a statistically significant association between the age of diagnosis with CKD and being thin (p value 0.002), as there were 38.5% thin patients in comparison to 68.2% normal overweight patients aged 5-9 years, as shown in Table 3.

The results showed that 38.5% of the thin patients were diagnosed with CKD inthe age range of 5-9 years and there was a statistically significant association between age of diagnosis with CKD and being thin (p value = 0.002).

Regarding the duration of haemodialysis, 44.2% of the thin patients were on haemodialysis for 12-23 months and for 34.6% of the thin patients, the cause of CKD was nephrotic syndrome.The duration of haemodialysis and the cause of CKD showed no statistically significant associations with being thin, and a high percentage of thin children (78.8%) had two haemodialysis sessions/week.This association failed to reach a significant level as shown in Table 3.

The results showed that the mothers of 76.9% of thin patients belonged to the age group of 30-39 years, the fathers of 57.1% of the thin patients were unemployed, and those of 38.1% of the thin patients were illiterate. There were no statistically significant associations between parents' age, employment, and education with being thin as shown in Table 4. Also, the results showed that 65.4% of the thin patients had a negative medical history, while 63.6% of normal/overweight patients had a negative medical history. There were no statistically significant associations between medical, surgical, and family history of the same condition of patients and being thin, as shown in Table 4.

Table 3.Association between Socio-demographic Characteristics, CKD Criteria of the Study Sample and their BMI for Age

(N =140)

Variables		BMI for Age				
		Wasted (<-1.0 Z-score) (n=52)		Normal & Overweight (n=88)		P value
		n	%	n	%	
Age (years)	1-4	7	13.5	1	1.1	<0.001*
	5-9	15	28.8	42	47.7	
	10-14	19	36.5	41	46.6	
	15-18	11	21.2	4	4.5	
Gender	Male	32	61.5	46	52.3	0.286
	Female	20	38.5	42	47.7	
Rank	First	18	34.6	27	30.7	0.557
	Second	20	38.5	30	34.1	
	Third	12	23.1	22	25.0	
	Fourth & more	2	3.8	9	10.2	
Age of diagnosis with CKD (years)	1-4	14	26.9	16	18.2	0.002*
	5-9	20	38.5	60	68.2	
	10-14	18	34.6	12	13.6	
Duration of HD (months)	<12	13	25.0	20	22.7	0.916
	12-23	23	44.2	36	40.9	
	24-35	12	32.1	25	28.4	
	≥ 36	4	7.7	7	8.0	
Frequency of HD (time/week)	One	2	3.8	15	17.0	0.085
	Two	41	78.8	65	73.9	
	Three	7	13.5	6	6.8	
	Four	2	3.8	2	2.3	
Cause of disease	Prolonged UT obstruction	15	28.8	24	27.3	0.458
	Nephrotic syndrome	18	34.6	23	26.1	
	Polycystic kidney disease	7	13.5	8	9.1	
	Cystinosis	3	5.8	10	11.4	
	Unknown cause	9	17.3	23	26.1	
*Significant difference between proportions using Pearson Chi-square test at 0.05 levels						

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202257

Table 4.Association between Parents' Socio-demographic Characteristics, Medical, Surgical and Family History of the Study Sample and their BMI for Age

(N =140)

Variables		BMI for age				P value
		Wasted (<-1.0 Z-score) (n=52)		Normal & Overweight (n=88)		
		n	%	n	%	
Mother's age (years)	20-29	6	11.5	11	12.5	0.838
	30-39	40	76.9	64	72.7	
	40-49	6	11.5	13	14.8	
Father's age (years)	20-29	3	5.8	2	2.3	0.320
	30-39	28	53.8	53	60.2	
	40-49	20	38.5	27	30.7	
	50-59	1	1.9	6	6.8	
Mother's employmentstatus	Employed	15	28.8	26	29.5	0.930
	Unemployed	37	71.2	62	70.5	
Father's employment status	Employed	9	42.9	43	36.1	0.331
	Unemployed	12	57.1	76	63.9	
Mother's educational status	Illiterate	8	38.1	43	36.1	0.140
	Primary	7	33.3	28	23.5	
	Secondary	4	19.0	43	36.1	
	College & higher	2	9.5	5	4.2	
Father's educational status	Illiterate	8	38.1	34	28.6	0.250
	Primary	4	19.0	27	22.7	
	Secondary	7	33.3	52	43.7	
	College & higher	2	9.5	6	5.0	
Medical history	Hypertension	14	26.9	31	35.2	0.098
	Diabetes mellitus	4	7.7	1	1.1	
	None	34	65.4	56	63.6	
Surgical history	Renal transplant	2	3.8	10	11.4	0.077
	Appendectomy	-	-	2	2.3	
	Tonsillectomy	2	3.8	-	-	
	None	48	92.3	76	86.4	
Family history of the same condition	Yes	23	44.2	40	45.5	0.888
	No	29	55.8	48	54.5	
*Significant difference between proportions using Pearson Chi-square test at 0.05 level						

Table 5 illustrated the association between the height for age and some socio-demographic characteristics of the respondents; the results revealed that more than half of the stunted patients 52.2%) belonged to the age group of 10-14 years. The child's age and rank showed statistically significant associations with being stunted, while the child's gender failed to achieve a statistically significant association with being stunted.There was a statistically significant association between age of diagnosis and height for age, as there were 5.9% stunted patients aged 1-4 years compared to 61.5% normal patients with the same age and there were 29.7% stunted patients aged 10-14 years compared to no normal patientinthe same age group. There were 40.6% of stunted patients with a duration of haemodialysis of12-23 months, andfor 29.7% of stunted patients, the cause of the disease was nephrotic syndrome. There were no significant

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202257

statistical associations between duration or frequency of haemodialysis, cause of the disease and height for age, as shown in Table 5.

The results showed the mothers of 74.3% of stunted patients belonged to the age group of 30-39 years, fathers of 36.6% of stunted patients were employed, and mothers of 38.6% of stunted patients were illiterate. There were no statistically significant associations between parents' socio-demographics and height for age.Regarding medical history, 33.7% of the stunted patients were hypertensive, only 5% of the stunted patients were diabetic, and about half of the sample had a negative medical history. There was no statistically significant association between height for age and medical, surgical, and family history of the same condition as shown in Table 6.

Table 5.Association between Demographic Characteristics, CKD Criteria of the Study Sample and their Height for Age

(N =140)

Variables		Height for age: Stunted(<-2.0 Z-score) (n=101)		Normal(>-2.0 Z-score) (n=39)		P value
		N	%	N	%	
Age (years)	1-4	-	-	8	20.5	<0.001*
	5-9	33	32.7	24	61.5	
	10-14	53	52.5	7	17.9	
	15-18	15	14.9	-	-	
Gender	Male	52	51.5	26	66.7	0.105
	Female	49	48.5	13	33.3	
Rank	First	39	38.6	6	15.4	0.007*
	Second	34	33.7	16	41.0	
	Third	24	23.8	10	25.6	
	Fourth & more	4	4.0	7	17.9	
Age of diagnosis with CKD (years)	1-4	6	5.9	24	61.5	<0.001*
	5-9	65	64.4	15	38.5	
	10-14	30	29.7	-	-	
Duration of HD (months)	<12	21	20.8	12	30.8	0.257
	12-23	41	40.6	18	46.2	
	24-35	29	28.7	8	20.5	
	≥ 36	10	9.9	1	2.6	
Frequency of HD (time/week)	One	11	10.9	6	15.4	0.615
	Two	79	78.2	27	69.2	
	Three	9	8.9	4	10.3	
	Four	2	2.0	2	5.1	
Cause of disease	Prolonged UT obstruction	27	26.7	12	30.8	0.953
	Nephrotic syndrome	30	29.7	11	28.2	
	Polycystic kidney disease	10	9.9	5	12.8	
	Cystinosis	10	9.9	3	7.7	
	Unknown cause	24	23.8	8	20.5	

*Significant difference between proportions using Pearson Chi-square test at 0.05 level

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202257

Table 6.Association between Socio-demographic Characteristics of the Parents, Medical, Surgical and Family History of the Study Sample and Height for Age

(N =140)

Variables		Height for age: Stunted (<-2.0 Z-score) No	Stunted %	Normal (>-2.0 Z-score) No	Normal %	P value
Mother's age (years)	20-29	11	10.9	6	15.4	0.636
	30-39	75	74.3	29	74.4	
	40-49	15	14.9	4	10.3	
Father's age (years)	20-29	3	3.0	2	5.1	0.627
	30-39	56	55.4	25	64.1	
	40-49	37	36.6	10	25.6	
	50-59	5	5.0	2	5.1	
Mother's occupation	Employed	28	27.7	13	33.3	0.513
	Unemployed	73	72.3	26	66.7	
Father's occupation	Employed	37	36.6	15	38.5	0.841
	Unemployed	64	63.4	24	61.5	
Mother's educational status	Illiterate	39	38.6	12	30.8	0.067
	Primary	26	25.7	9	23.1	
	Secondary	34	33.7	13	33.3	
	College & higher	2	2.0	5	12.8	
Father's educational status	Illiterate	31	30.7	11	28.2	0.166
	Primary	23	22.8	8	20.5	
	Secondary	44	43.6	15	38.5	
	College & higher	3	3.0	5	12.8	
Medical history	Hypertension	34	33.7	11	28.2	0.264
	Diabetes mellitus	5	5.0	-	-	
	None	62	61.4	28	71.8	
Surgical history	Renal transplant	10	9.9	2	5.1	0.469
	Appendectomy	2	2.0	-	-	
	Tonsillectomy	2	2.0	-	-	
	None	87	86.1	37	94.9	
Family history of the same condition	Yes	42	41.6	21	53.8	0.191
	No	59	58.4	18	46.2	

*Significant difference between proportions using Pearson Chi-square test at 0.05 level

Discussion

Providing adequate caloric supply, particularly in infants and young children with CKD, is of paramount importance because of the numerous effects of nutritional status on growth and neurocognitive development. Albeit cachexia and protein-energy wasting are well reported among adult

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202257

patients with CKD, data regarding the prevalence in children with CKD are limited.[1,11]

In the current study, more than one-third of children were thin according to BMI for age, and the remaining were normal, with no observed cases of overweight or obesity. Besides, more than two-thirds were stunted and severely stunted.

The results were approximately similar to the results of a previous Iraqi study done by Ali et al., who collected the data from three Pediatric Nephrology Centers in Baghdad. The study reported that 71% of children had height below 2 SDs of their height-for-age, and 72% had weight-for-age below their specific 5th percentile.[12] While the results of the present study were inconsistent with the results of the study by Tan et al. study which was carried out in Brunei in 2016, to investigate the factor that might affect the growth of 87 patients below the age of 18 years suffering from CKD. It reported that 25.3% of the studied patients were thin, and 31.1% of them were stunted.[13] These findings can be explained by the fact that growth and height faltering are not uncommon in children with CKD due to the numerous factors provento be associated with them; mainly three primary causes contribute to these changes, which include: loss of appetite, increased energy expenditure, and muscle mass wasting. Anorexia is reported to be correlated with GFR and is even related to prognosis and quality of life,[3] while more complex interactions are involved in muscle wasting, which starts from anorexia, malnutrition, and abnormalities in insulin-like growth hormone.Providing simple protein, fat, and carbohydrate supplementation is not enough to increase lean muscle mass, which might also be related to metabolic imbalances, abnormally-higher catabolism, and dialysis-related derangements,[14] in addition to inflammatory changes and cytokines release. Also, numerous markers are associated with anorexia and increased energy expenditure like abnormalities in Leptin release, melanocortin signalling, interleukin-1α, interleukin-6 and others.[15]

In the current study, factors that were related to being thin for age included younger age and young age-onset of CKD, but the age group of 15-18 yearsand those being diagnosed at the age of 10-14 yearsalso had a high rate of thin children. This was comparable to the results of a study carried out by Bonthuis et al. in the Netherlands in 2013, who investigated the growth status of 4,474 children with CKD, younger than 16 years of age, from 25 European countries and reported that 15.8% of children aged one year and below were underweight and 9.0% were overweight or obese, and those children within this age group had 48% more odds for being underweight, while children older than 6 years were protected against it.[16] A review article done by Mastrangelo et al. in 2014 demonstrated that young age and young age-onset of CKD are additional risk factors.[17] The increased risk for thinness in the two age boundaries in the present study could be explained by the additional need for nutrients during the first years of life and during a puberty growth spurt, as in CKD children, where the development of secondary sexual characteristics is delayed later than normal and its degree impaired, resulting in loss of growth potential and reduced final height.[18,19] This also explains the very high rate of stunting in the current study of patients aged older than 10 years, because CKD causes an irreversible loss of growth potential, due to metabolic and hormonal disturbances or due to medication like steroids.[20]

In the current study, the percentage of males and females is approximately equal and the results revealed that gender has no significant association with being thin or stunted. This finding goes in line with the results of aprevious Iraqi study done by Ali et al. who reported that gender did not associate with having a low BMI for age.[13] Another European study failed to report a significant association between gender and being thin.[18]

In this study, HD frequency and duration were not associated with thinness or stunting. Patients may develop long term consequences due to HD that was not reached in this study. Supporting this concept; a study was conductedby Souilmi et al. in Morocco, who investigated the growth parameters of adult patients who were on HD before the age of 18 years, and stated that frequency and duration of HD had a significant association with being thin and stunted,[21] but there is growing evidence that daily haemodialysis reaches better height compared to conventional haemodialysis, as de Camargo et al. proved in theirstudy conducted in Brazil. Itwas a prospective comparative study on 50children, whichreported that in the daily dialysis group, children had better caloric intake and 33% of them showed catch-up growth compared to 8% in the conventional haemodialysis group.[22]

Conclusion

The present study showed that children with chronic kidney disease were under nourished with about three-fourths having been detected as having chronic malnutrition (stunted and severely stunted). There was a significant statistical association between low height for age (being stunted) and the patient's age, and the age of diagnosis in addition to the child's rank in the family.

Source of Funding: None

Conflict of Interest: None

References

1. Mak RH, Cheung WW, Zhan JY, Shen Q, Foster BJ. Cachexia and protein-energy wasting in children with chronic kidney disease. Pediatr Nephrol. 2012

Feb;27(2):173-81. [PubMed] [Google Scholar]
2. Kent PS, McCarthy MP, Burrowes JD, McCann L, Pavlinac J, Goeddeke-Merickel CM, Wiesen K, Kruger S, Byham-Gray L, Pace RC, Hannahs V, Benner D. Academy of Nutrition and Dietetics and National Kidney Foundation: revised 2014 standards of practice and standards of professional performance for registered dietitian nutritionists (competent, proficient, and expert) in nephrology nutrition. J Acad Nutr Diet. 2014 Sep;114(9):1448-57. [PubMed] [Google Scholar]
3. Ayestaran FW, Schneider MF, Kaskel FJ, Srivaths PR, Seo-Mayer PW, Moxey-Mims M, Furth SL, Warady BA, Greenbaum LA. Perceived appetite and clinical outcomes in children with chronic kidney disease. Pediatr Nephrol. 2016 Jul;31(7):1121-7. [PubMed] [Google Scholar]
4. Apostolou A, Printza N, Karagiozoglou-Lampoudi T, Dotis J, Papachristou F. Nutrition assessment of children with advanced stages of chronic kidney disease-asingle center study. Hippokratia. 2014 Jul;18(3):212. [PubMed] [Google Scholar]
5. Duggan C, Watkins JB, Koletzko B, Walker WA, editors. Nutrition in pediatrics: basic science, clinical applications. Vol 1. PMPH USA Ltd; 2016. [Google Scholar]
6. Gunal AI. How to determine 'dry weight? Kidney Int Suppl. 2013 Dec;3(4):377-9. [PubMed] [Google Scholar]
7. Gandy J, editor. Manual of dietetic practice. John Wiley & Sons; 2019. [Google Scholar]
8. Gao T, Leonard MB, Zemel B, Kalkwarf HJ, Foster BJ. Interpretation of body mass index in children with CKD. Clin J Am Soc Nephrol. 2012 Apr;7(4):558-64. [PubMed] [Google Scholar]
9. Mansourian M, Marateb HR, Kelishadi R, Motlagh ME, Aminaee T, Taslimi M, Majdzadeh R, Heshmat R, Ardalan G, PoursafaP. First growth curves based on the World Health Organization reference in a Nationally-Representative Sample of Pediatric Population in the Middle East and North Africa (MENA): the CASPIAN-III study. BMC Pediatr. 2012 Dec;12(1):149. [PubMed] [Google Scholar]
10. Martinez-Millana A, Hulst JM, Boon M, Witters P, Fernandez-Llatas C, Asseiceira I, Calvo-Lerma J, Basagoiti I, Traver V, De Boeck K, Ribes-Konickx C. Optimisation of children z-score calculation based on new statistical techniques. PloS One. 2018;13(12):e0208362. [PubMed] [Google Scholar]
11. Foster BJ, McCauley L, Mak RH. Nutrition in infants and very young children with chronic kidney disease. Pediatr Nephrol. 2012;27(9):1427-39. [PubMed] [Google Scholar]
12. Ali SH, Ali AT, Hasan AA. Etiology of chronic kidney disease in children in three Pediatric Nephrology Centers in Baghdad. Int J Curr Microbiol App Sci. 2019;8(1):1547-55. [Google Scholar]
13. Tan SY, Naing L, Han A, Khalil MA, Chong VH, Tan J. Chronic kidney disease in children and adolescents in Brunei Darussalam. World J Nephrol. 2016;5(2):213-9. [PubMed] [Google Scholar]
14. Iorember FM. Malnutrition in chronic kidney disease. Front Pediatr. 2018;6:161. [PubMed] [Google Scholar]
15. Tu J, Cheung WW, Mak RH. Inflammation and nutrition in children with chronic kidney disease. World J Nephrol. 2016;5(3):274. [PubMed] [Google Scholar]
16. Bonthuis M, van Stralen KJ, Verrina E, Groothoff JW, Melgar ÁA, Edefonti A, Fischbach M, Mendes P, Molchanova EA, Paripović D, Peco-Antic A, Printza N, Rees L, Rubik J, Stefanidis CJ, Sinha MD, Zagożdżon I, Jager KJ, SchaeferF. Underweight, overweight and obesity in paediatric dialysis and renal transplant patients. Nephrol Dial Transplant. 2013;28(suppl4):iv195-iv204. [PubMed] [Google Scholar]
17. Mastrangelo A, Paglialonga F, Edefonti A. Assessment of nutritional status in children with chronic kidney disease and on dialysis. Pediatr Nephrol. 2014;29(8):1349-58. [PubMed] [Google Scholar]
18. Haffner D, Fischer DC. Growth and pubertal development in dialyzed children and adolescents. In:Warady B, Schaefer F, Alexander S, editors. Pediatric Dialysis.Springer; 2012. p. 453-81. [Google Scholar]
19. Haffner D, Zivicnjak M. Pubertal development in children with chronic kidney disease. PediatrNephrol. 2017;32(6):949-64. [PubMed] [Google Scholar]
20. Rogol AD, Hayden GF. Etiologies and early diagnosis of short stature and growth failure in children and adolescents. JPediatr. 2014 May;164(5):S1-4. [PubMed] [Google Scholar]
21. Souilmi FZ, Houssaini TS, El Bardai G, Kabbali N, Arrayhani M, Hida M. The fate of patients who started hemodialysis during childhood or adolescence: results of an interregional Moroccan Survey. Int Sch Res Notices. 2014;2014:389729. [PubMed] [Google Scholar]
22. de Camargo MF, Henriques CL, Vieira S, Komi S, Leao ER, Nogueira PC. Growth of children with end-stage renal disease undergoing daily hemodialysis. Pediatr Nephrol. 2014;29(3):439-44. [PubMed] [Google Scholar]

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202257