Nutritional Status and Academic Achievement among School-Age Children with Chronic Kidney Disease at Assiut University Children Hospital

Laith M. Al-Osoufi, Clinical Instructor, Al-Hussein bin Talal University, Jordan
Prof. Kawthar A. Fadel, Professor of Community Health, Faculty of Medicine, Assiut University
Prof. Ahmad R. Ahmad, Professor of Pediatrics, Faculty of Medicine, Assiut University
Dr. Asma A. Mohammad, Assistant Professor of Pediatrics Nursing, Faculty of Nursing, Assiut University

ABSTRACT

Chronic kidney disease (CKD) is recognized as a major health problem affecting approximately 13% of the US population. Nutritional status and academic achievement were affected in 1.3% of Egyptian school age children with urinary abnormalities. **Aim:** to assess nutritional status and academic achievement among school-age children with chronic kidney disease at Assiut University Children Hospital. **Subjects and Method:** The study sample was composed of 102 school-age children with CKD. The study was conducted in the Pediatric Nephrology Unit and Outpatient Clinics at Assiut University Children Hospital. Data were collected by utilizing the designed questionnaire sheet that consists of sociodemographic data, socioeconomic data, children's anthropometric measurement as well as assessment of their academic achievement. **Results:** The results of study revealed that the percentage of anthropometric school-age children under study was normal or around average with no statistical significant between CKD and nutritional status. Regarding academic achievement, about one third of the studied children with CKD had pass average academic achievement score. **Conclusions:** Based on the results of the present study, chronic kidney disease did not affect nutritional status, but it negatively affected academic achievement in school-age children at Assiut Children University Hospital.

Introduction

Chronic kidney disease (CKD) is a common condition that has significant implications for patients' health and healthcare budgets. CKD is diagnosed if evidence of kidney damage has been present for more than 3 months; it is divided into five stages depending on the glomerular filtration rate (GFR), **Stage 1**: normal GFR $\geq$ 90 mL/min per 1.73 m2 and persistent albuminuria ,**Stage 2**: GFR between 60 to 89 mL/min per 1.73 m2, **Stage 3**: GFR between 30 to 59 mL/min per 1.73 m2 ,**Stage 4**: GFR between 15 to 29 mL/min per 1.73 m2 and **Stage 5**: GFR of < 15 mL/min per 1.73 m2 (**Evan and Taal , 2011**).

Also, it's recognized as major health problem affecting approximately 13% of the US population (**Manuscript et al., 2009**). The urinary abnormalities in Egyptian school children were reported to be 1.3% (**Parakh. et al., 2012**).

Malnutrition is recognized to be a serious and common complication of CKD and is associated with increased morbidity and mortality. Growth failure is a common and significant clinical problem in children with chronic renal failure (**Zaki et al, 2012**).

Children with CKD are at risk for cognitive dysfunction. Studies continue to show that children with CKD demonstrate deficits on neurocognitive testing as well as academic achievement that is significantly below grade level in comparison with healthy children (**Duquette et al , 2007**).

Assessment of nutritional status in infants, children, and adolescents should include anthropometric measurements, which are used to measure childhood growth; growth and development during childhood depends on optimal nutrition, health, and environmental condition (**Chiocca,2011**).

The nurse's role in school-age children growth and development includes assessing growth and development, promoting healthy growth and development, and addressing common developmental concerns (**Wong et al., 2009**). Within the last 2 decades very little research has been carried out to elucidate the causes of impaired renal function among Egyptian children and, there are very limited previously published studies that conducted in Assuit University Children Hospital about assessment of nutritional status among school children with chronic kidney disease.

Aims of the study

This study aimed at:

1. Assessing nutritional status in school-age children with CKD At Assiut University Children Hospital and,

2. Determining the academic achievement of school-age children.

Subjects and Method

A cross-sectional descriptive research design was utilized in this study.

Research Question:

What are the nutritional status and academic achievement among school-age children with chronic kidney disease?

Setting:-

The study was conducted in the Pediatric Nephrology Units and Outpatient Clinics at Assiut University Children Hospital.

Sample:-

All children attended the Pediatric Nephrology Outpatient Clinic or admitted to the Pediatric Nephrology Unit at Assiut University Children Hospital who had chronic kidney disease (CKD) during a 6 month period were included in this study from November 2013 to May 2014 and the study sample was composed of 102 school-age children with CKD.

Inclusion criteria:-

Children of both sexes aged 6–12 years, suffering from (CKD), such as nephrosclerosis, chronic glomerulonephritis, nephrotic Syndrome and Polycystic kidney disease and not on dialysis.

Tools of the study

Tool (I): Structured Questionnaire Sheet

It was designed by researcher and used specifically to collect data from studied school-age children. It consists of two parts as follows:

Part one: - Socio-demographic data of school age children with CKD such as name, age, sex , birth order, residence and, children's parents socioeconomic data such as father's education, type of house, monthly family income in EGP, father's and mother's occupation.

Part two: - medical history of children with emphasis on the onset, duration, data of admission, diagnosis and the presence of relevant family history of renal disease.

Tool (II): **Anthropometric Measurement sheet**:-

Growth parameter measurements included weight for age, height for age, mid-arm circumference for age, skin fold thickness for age were plotting by **(WHO, 2007)**, and were used to identify growth parameters of school children with CKD.

Measurement procedure for anthropometric Parameters:

Weight measurement:

Weight was measured by using a beam balance scale. The scale was put on a firm surface floor and set at zero reading. Each child removed shoes, heavy outer clothing such as sweaters, jackets, vests and belts and was asked to step on the scale platform, facing away from the scale with both feet on the platform, and remain still. The researcher read the weight value to the nearest ¼ pound or (1/10) kilogram and recorded weight immediately before the child got off the scale.

Mid-arm circumference (MAC) measurement:

Mid-arm circumference was measured by asking the child to expose his or her left arm and remove the clothing. The arm was extended to measure the length of the arm from the shoulder to the elbow and determine the midpoint. After that a tape was wrapped around the midpoint without pressing on the arm, and then measurement was observed and recorded on sheet III.

Skin fold thickness measurement:

Skin fold thickness was measured by a skin fold thickness caliper. The child was made to stand upright with the weight evenly distributed on both feet, the shoulders relaxed, and the arms hanging loosely at the sides. The thumb and index fingers were used to grasp a fold of skin and subcutaneous adipose tissue approximately 2.0 cm above the mid-arm circumference mark. The tip of the caliper jaws was placed over the complete skin fold; the skin fold thickness was measured to the nearest 0.1 mm and recorded on sheet III.

Height measurement:

The height of children was measured by a stand meter. Each child was asked to remove his shoes, bulky clothing, and hair ornaments, unbraid hair, and stand with the feet flat together and against the wall. The researcher made sure that the legs were straight, the arms were at sides, and the shoulders were leveled and that the child was looking straight ahead, the line of sight was parallel with the floor, and the child's head, shoulders, buttocks, and heels touching the flat surface (wall). The researcher used a flat headpiece to form a right angle with the wall and lowered the headpiece until it firmly touched the crown of the head and the researcher eyes were at the same level as the headpiece. Then the researcher marked where the bottom of the headpiece met the wall. Then, by using a metal tape the researcher measured from the base on the floor to the marked measurement on the wall to get the height measurement. Finally, the researcher accurately recorded height to the nearest 1/8th inch or 0.1 centimeter on tool III.

Tool (III): Academic Achievement Assessment

Level of academic achievement was recorded based on marks given to each student at the end of the 1st and 2nd semesters of the academic year 2013-2014. Average marks were calculated to be used as global score; score will be adapted to a scale from:- Excellent (>= 85.0%), very good (>=75.0), good (>=65.0), passed (>=50.0%) and failed (<50.0%). according to guidance of laws Egyptian Ministry of Education.

Method of data collection:

1. Formal administrative approvals were taken before the start of the study.
2. An official permission was obtained from the Faculty of Nursing at Assiut University to start collect data.
3. An official permission was obtained from the chairman of the Pediatric Nephrology Unit at Assiut University Children Hospital to collect data.
4. An oral consent was obtained from the children and their parents to collect data.
5. The researcher explained the eligibility of children and parents for the research. The parents have ethical rights to agree or refuse to participate in the study.

6. A pilot study was carried out on 10 children who suffered from chronic kidney disease (CKD). Collected data were used for testing the clarity and applicability of the sheet and the time allowed to fill in the sheet was 15 min. According to the results of the pilot study, the essential modifications in the sheet were made and the final form was developed, and 10 children were excluded from the study sample.

7. **Field work**

The researcher introduced himself to initiate a line of communication with parents and children, and got parents' phone number, explain the nature and purpose of the study and obtained oral consent and cooperation throughout the interview. Relative information about Sociodemographic and economic were recorded in the designed Tool I &Tool II. Data were collected for the study from 1/11/2013 to 1/5/2014 on Saturday, Sunday, Monday, and Tuesday in the clinics in the morning shift and on Wednesday, Thursday in the department.

Data analysis:-

Data entry was done using a compatible personal computer by the researcher. All data were entered into SPSS, Version 19.0 for analysis and EXCEL for figures. The content of each tool was analyzed, categorized and then coded by the researcher. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviation for quantitative variables. Chi-squire test was used to determine the differences between the nutritional status and academic achievement in relation to socioeconomic, sociodemographic and clinical data of the studied school-age children. Differences were considered Statistically significant was considered at $P\text{-value} < 0.05$.

Results

Table (1):- Sociodemographic Characteristics of School-age Children with CKD.

Items	Total (No) = 102	
	No.	**%**
Age(Years)		
6— 8	15	14.7
8— 10	39	38.2
10— 12	48	47.1
Mean ± SD	**2.3±0.71**	
Gender		
Male	61	59.8
Female	41	40.2
Residence		
Rural	97	95.1
Urban	5	4.9
Birth order		
1st	27	26.5
2nd	22	21.6
3rd	16	15.7
4th	11	10.8
5th	7	6.9
>5	19	18.5

Table (2):- Socioeconomic Characteristics of Parents of School-age Children with CKD.

Item	Total No=(102)	
	NO	**%**
1)Father's Occupation		
- Worker	31	30.4
- Farmer	38	37.3
- Teacher	7	6.8
-Other	26	25.5
2)Mother's Occupation		
- Housewife	93	91.1
- Worker	9	8.7
3)Father's Education		
-Illiterate	38	37.3
- Primary education	32	31.4
-Diploma and B.Ch.	31	30.4
- Master and Ph.D.	1	1.0
4)Type of house		
- Owned	10	9.8

-Rented.	92	90.2
Monthly income (EGP)		
- < 100 **EGP**	1	1.0
- 100-200 **EGP**	9	8.8
- 200-400 **EGP**	20	19.6
- 400-800 **EGP**	44	43.1
- 800-1500 **EGP**	24	23.5
- >1500 **EGP**	4	3.9

Table (3):- Growth Parameter Percentile of children with CKD.

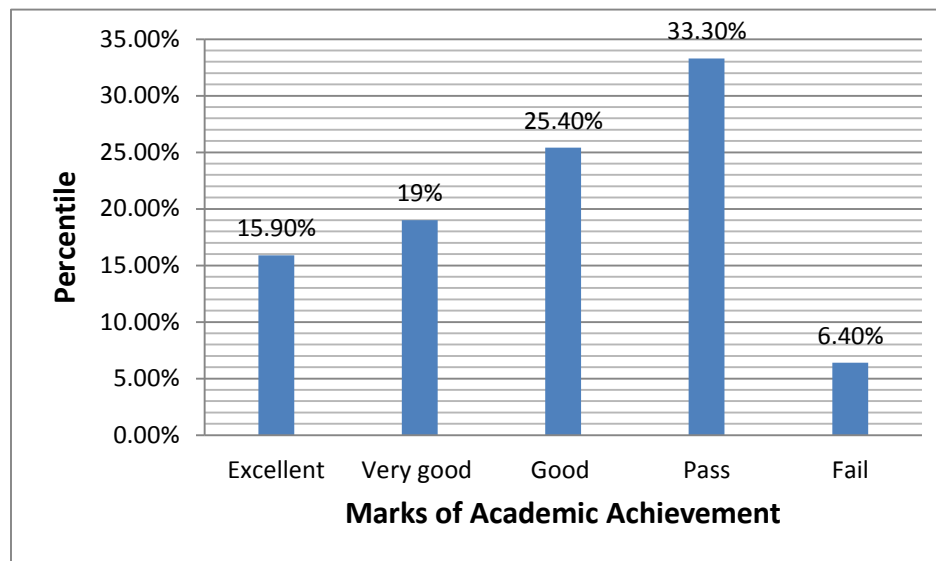| Items	Total No=(102)	
	No.	**%**
1) Weight for age		
Underweight	13	12.7
Normal	89	87.3
Obese	0	0
2) Height for age		
Stunt	40	39.2
Average	62	60.8
Tall	0	0
3) Mid-arm circumference		
Wasted	8	7.8
Average	87	85.3
High muscle good nutrition	7	6.9
4) Skin fold thickness		
Lean	17	16.7
Normal	84	82.4
Excessively fat	1	1.0

Figure (1):- Percentage distribution of the school age children with CKD, according to academic achievement.

Table (4):- Relationship between residence of school age children with CKD and Anthropometric Measurement.

Item	Weight P-value	Height P-value	MAC P-value	SFT P-value
Residence	0.498	**0.05**	0.416	0.956

Table (5):- Relationship between parents Socioeconomic Characteristics and anthropometric measurement

Item	Weight			Height			MAC			SFT		
	NO	%	P-value	NO	%	P-value	NO	%	P-value	NO	%	P-value
Father's Occupation												
- Worker	5	5	0.483	17	17	0.275	3	3	**0.004**	6	6	0.713
- Farmer	6	6		12	12		4	4		8	8	
- Teacher	5	5		4	4		1	1		1	1	
- Other	1	1		8	8		0	0		2	2	
Mother's Occupation			0.364			0.487			**0.004**			0.401
- Housewife	14	14		36	36		6	6		14	14	
- Worker	5	5		5	5		2	2		3	3	

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	No	%	P-value	No	%	P-value	No	%	P-value	No	%	P-value
Father's Education												
- Illiterate	6	6	**0.041**	13	13	0.117	4	4	**0.022**	4	4	0.109
- Primary education	4	4		17	17		1	1		4	4	
- Diploma and B.Ch.	2	2		9	9		2	2		8	8	
- Master and Ph.D.	1	1		1	1		1	1		0	0	
Type of house												0.514
- Owned	1	1	0.627	2	2	0.167	2	2	**0.002**	1	1	
- Rented.	12	12		38	38		6	6		15	15	
Monthly income (EGP)												
- < 100 **EGP**	0	0	0.123	0	0	0.261	0	0	**0.007**	0	0	0.636
- 100-200 **EGP**	3	3		4	3		1	1		0	0	
- 200-400 **EGP**	5	5		8	8		4	4		5	5	
- 400-800 **EGP**	3	3		13	13		1	1		8	8	
- 800-1500 **EGP**	2	2		14	14		2	2		3	3	
- >1500 **EGP**	0	0		1	1		0	0		1	1	

Table (6):- The relationship between mother's Occupation and academic achievement.

Item	Excellent		Very Good		Good		Pass		Fail		P-value
Mother's occupation	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	
Housewife	11	10.8	18	17.6	24	23.5	32	31.4	5	4.9	**0.006***
Worker	0	0.0	1	1.0	1	1.0	1	1.0	0	0.0	
Teacher	2	2.0	0	0.0	1	1.0	1	1.0	2	2.0	
Other	3	2.9	0	0.0	0	0.0	0	0.0	0	0.0	
	Total=102										

Table 1 presents the percentage distribution of school-age children with CKD sociodemographic characteristics.

Regarding age, the percentages of the age groups (6-8), (8-10) and (10-12) of the school-age children with CKD were 14.7%, 38.2 %, 47.1%, respectively. Regarding age mean ±SD it was 2.3±0.71 in school-age children with CKD.

As regards the sex of children, most of the studied school-age children with CKD were males (59.8%), while 40.2% were females. Also the highest percentage of the studied school-age children live in rural areas (95.1%), while a minority of them (4.9%) live in urban areas.

Regarding birth order in the studied school-age children with CKD, the first child represents 26.5%, the second child 21.6%, the third child 15.7%, the fourth child 10.8%, the fifth child 6.9% and $> 5^{th}$ child 18.5%.

Table (2) presents the percentage distribution of the studied school-age children according to the socioeconomic characteristics of parents regarding father's education, mother's education and type of house.

Regarding father's education, around two fifths of school-age children with CKD were illiterate (37.3%). As regards the type of house, the vast majority of school-age children with CKD live in rented houses (90.2%). As regards monthly family income, two fifths of the parents of the studied school-age children with CKD (43.1%) have a monthly income of 400-<800 EGP. Regarding father's profession, more than one third the fathers of school-age children with CKD were farmers (37.3%). As regards mother's profession, the majority of the mothers of school-age children with CKD were housewives (88.2%).

Table (3) illustrates the growth parameter percentile of studied school-age children with CKD.

As regards the mean± SD of the weight (kg) of the studied school-age children for age was 28.2±7.8, the mean± SD of height (cm) for age was 1.2±1.0, the mean± SD of mid-arm circumference (cm) was 20±3.0, and the mean± SD of skin fold thickness (cm) was 1.1±0.67.

The vast majority of school-age children with CKD had normal and average weight, height, mid-arm circumference, skin fold thickness (87.3%, 60.8%, 85.3%, 82.4%, respectively).

Figure (1) shows the distribution of the studied school-age children with CKD according to the average score of academic achievement.

The majority of the studied school-age children with CKD were pass (33.3%), while the minority of them were fail (6.4%,).

Table (4) shows the relationship between residence of school age children with CKD and anthropometric measurement. A highly statistically significant difference was found between the urban area and height for age of the studied children.

Table (5) illustrates the relationship between socioeconomic data and anthropometric measurement. A highly statistically significant relation was found between the studied school-age children's weight, mid-arm circumference and father's education. Regarding the type of house, a highly statistically significant relation was found with mid-arm circumference and with skin fold thickness. As regards father's profession, mother's profession and family monthly income, a highly statistically significant relation was found with mid-arm circumference ($P \leq 0.05$).

Table (6) shows the relationship between mother's occupation and academic achievement. A highly statistically significant relation was found between academic achievement and the occupation of the mothers of the school age children with CKD.

Discussion:

The present study involved 102 school-age students who were suffering from chronic kidney disease. The aim of the study was to assess nutritional status and academic achievement among school-age children with chronic kidney disease at Assiut University Children Hospital.

Based on the results of the present study, more than half of the studied school-age children with CKD were males. The highest age range of school-age children with CKD was between 10 and 12 years and the majority of them lived in rural area.

As regards the age of school-age children with CKD, **Zivicnjak et al. (2007)** reported that school children aged 7-12 years and school children aged less than 3-6 years suffer from a growth deficit, and this result disagrees with result present study .

As regards residence of school-age children with CKD, **Soylemezoglu et al. (2012)** reported that more than half of school-age children live in rural areas. This finding agrees with the present study which revealed that most of the school children under study live in rural areas.

In the current study most of the families of the studied school children had a monthly income of 400–800 EGP. This finding is consistent with the results of **Tawfik et al.'s (2002)** case control study which indicated that two thirds of patients with such a

delayed presentation live in rural areas. The high incidence of renal impairment due to infection gastroenteritis reflects a poor socio-economic level.

Furthermore, this finding is in consistent with **Barry . (2006)** who believes that low socioeconomic status prevents access to resources and leads to additional stress and conflicts at home that affect all aspects of a child's life including academic achievement**.**

The results of the present study indicated that there is a significant relation between the educational level of fathers and mothers and chronic kidney disease in children. The results of the current study indicated that more than one third of the fathers school age children were illiterate. This may be due to the low social class of those having a large number of siblings, the great effect of late counseling and late doctor and clinic visit, then the delay of diagnosis and treatment. This finding is in line with **El-Sayed's (2013)** study conducted at Assiut University Children Hospital, which reported that more than half of the mothers of the studied school children and 40% of the fathers of the studied school-age children were illiterate.

Fayed et al .,(2013) stated that malnutrition and growth delay are common in children with chronic kidney disease. Finally, I think that the reason for the absence of malnutrition in our study sample may be due to the early stage of the disease.

As regards nutritional status, more than two thirds of the children under study had normal body weight and around normal height. Regarding mid-arm circumference, most of the studied school-age children had an average size. This finding disagrees with **Bethany and Mary. (2005)** who stated that children with CKD are generally believed to be at high risk for wasting. **Foster** added that protein energy malnutrition may be a mechanism for growth restriction and lean mass wasting among children with CKD. In the present study, majority of the school age children's with CKD skin fold thickness was normal.

Zaki et al. (2012) stated that skin fold thickness was slightly reduced. This finding is in disagreement with the present study which indicated that a high percentage of the studied school children had normal skin fold thickness.

Regarding academic achievement of school age children in the present study, one third of them had a score of pass. This finding agrees with **Duquette et al. (2007)** who

found that school-age children with CKD were more likely than the controls to have intelligence scores below the average range.

As regards the relationship between mother's occupation and academic achievement, it can be concluded that the academic achievement of the children of a high percentage of mothers who were housewives was pass. This may be explained by the fact that mother employment is an overload and that she does not have enough time to follow her children's education. This result agreed with **Masoumi et al. (2013)** who found that mother's employment has a significant effect on the educational achievement of children.

Conclusion

In conclusion, the present study indicated that chronic kidney disease does not significantly affect school-age children's nutritional status. The academic achievement of school age children with CKD are influenced by their mother's occupation, so assessment of academic achievement and nutritional status is an essential part of medical and nursing care for chronic kidney disease children to identify who are at risk.

Recommendations
1. Educating mothers in rural areas about nutrition and chronic kidney disease in children.
2. Organizing a nutrition program in school to support the cognitive functioning of students suffering from chronic kidney disease.
3. Preparing an educational program for Assiut University Children Hospital nurses who deal with CKD patients about the disease.
4. Adding measuring nutritional assessment as a routine of children who arrived at outpatient urology clinics and urology department in addition to weight and height.

Acknowledgment:-

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