

Kidney Disease Profile of Syrian Refugee Children

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Introduction. Although preventative nephrology is the effective management of childhood kidney diseases, it is hard to provide it in this undesirable conditions. In this study, we aimed to document the kidney disease profile of Syrian refugee children admitted to our hospital.

Materials and Methods. One hundred and thirty Syrian refugee children were admitted to the Pediatric Nephrology Department of the University of Gaziantep from September 2012 to January 2015. Demographic data, history, symptoms, physical examination findings, laboratory investigations, diagnosis, disease outcome, and therapeutic procedures such as peritoneal dialysis and hemodialysis were obtained from patient files.

Results. Of the 130 admitted children, 74 were girls (59.6%). The average age was 6.97 ± 4.2 years (range, 1 month to 17 years). Congenital abnormalities of the kidney and urinary tract were found in 34 children (26.2%). Other morbidities were chronic kidney disease in 30 (23.1%), nephrotic syndrome in 24 (18.5%), urolithiasis in 9 (6.9%), acute kidney injury in 4 (3.1%), glomerulonephritis in 5 (3.8%), enuresis in 12 (9.2%), and others in 12 (9.2%).

Conclusions. Congenital abnormalities of the kidney and urinary tract and chronic kidney disease were highly prevalent in Syrian refugee children. Although free health care have been provided to all of these children, the continuation of political crisis and instability would increase the number of admissions and affect the quality of life of those children in a different environment from the home country.

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INTRODUCTION

Almost 4 years have passed since the political crisis and instability began in Syria. It has cost thousands of lives, while injured and displaced many of them. According to the Disaster Emergency and Management Agency of the Government of Turkey, roughly 500 000 Syrians live in and outside the camps and in provinces in Turkey.¹ Basic needs such as shelter, food, and health care, and also education, social activities, and employment opportunities are provided by the

Turkish government.

Doctors are now trying to provide health care services to this large population having no previous medical records, socially and psychologically affected, with language barrier. Thus, an audit of kidney diseases in refugee children may provide data for taking attention to affected children both in our environment and other places. Although preventative nephrology is the effective management of childhood kidney diseases, it is really hard to provide it in this undesirable

situation. In this study, we aimed to document the kidney disease profile of Syrian refugee children admitted to our hospital.

MATERIALS AND METHODS

Study Center and Population

The study was carried out at the Pediatric Nephrology unit of Gaziantep University, which is a tertiary hospital in the area providing pediatric nephrology care to children. Our university is located south-east of Turkey, which has a border to Syria. It is apparent that the patient population is not homogeneous and substantial proportion of the patient population has low socio-economic status. For these patients, health care is free, provided by the Turkish government.

Data Collection

We evaluated 130 children (between the age of 1 month to 17 years) admitted to our hospital from September 2012 to January 2015, through patient files, retrospectively. All patients were Syrian refugee children. This study included the demographic data, history, physical examination, weight Z-score, height Z-score (by the World Health Organisation software, January 2011 anthropometric calculator), laboratory investigations, diagnosis, disease outcome and all applied procedures, such as peritoneal dialysis or hemodialysis. The investigations mostly were complete blood count, erythrocyte sedimentation rate, urinalysis, urinary protein estimation, urine culture, and blood chemistry. Further investigations were carried out if needed, such as renal ultrasonography, intravenous urography, micturating cystourethrography, and renal biopsy. Chronic kidney disease (CKD) and nephrotic syndrome (NS) were defined as on the Kidney Disease Outcomes Qualitative Initiative and the International Study of Kidney Disease in Children guideline,² and acute kidney injury (AKI) was defined on the pRIFLE criteria (risk, injury, failure, loss, end-stage), respectively. Stage 4 and stage 5 of CKD were included to the CKD group. Early stages of CKD were noted in the primary renal pathologies such as urolithiasis, NS, and congenital anomalies of the kidney and urinary tract (CAKUT).

Statistical Analysis

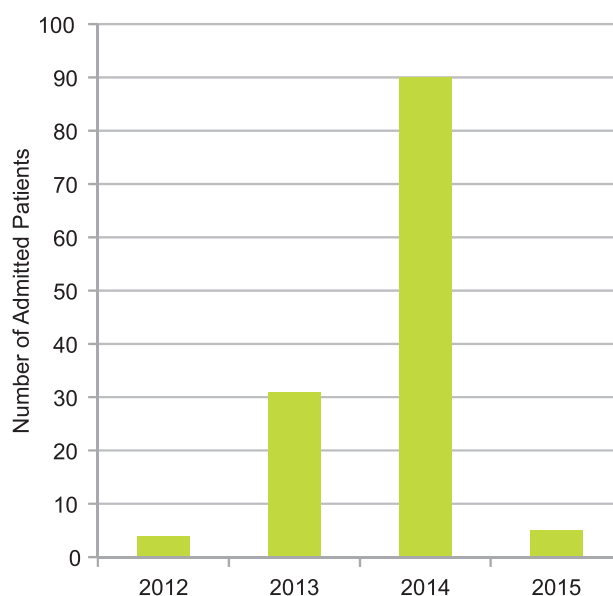
Data was analyzed using the SPSS software

(Statistical Package for the Social Sciences, version 17.0, SPSS Inc, Chicago, IL, USA). Continuous data were presented as mean or median, as appropriate, while categorical data were presented as percentages.

RESULTS

One hundred and thirty children were admitted to our hospital between September 2012 and January 2015, and 74 of the patients were girls (59.6%). The average age was 6.97 ± 4.2 years (range, 1 month to 17 years). The Figure shows a gradual rise from 2012 to 2014 in pediatric renal admissions from 3% to 69%. Since only the 1st month of 2015 was included in the study, data from this year was a small percentage (4%).

The spectrum of the kidney diseases is shown in Table 1. The majority of the patients were



Pediatric renal admissions of Syrian refugee children between 2012 to 2015.

Table 1. Spectrum of Pediatric Kidney Disease Among 130 Syrian Refugee Children

Disorders	Number of Patients (%)
Nephrotic syndrome	24 (18.5)
Congenital anomalies of the kidney and urinary tract	34 (26.2)
Urolithiasis	9 (6.9)
Chronic kidney disease	30 (23.1)
Acute kidney injury	4 (3.1)
Glomerulonephritis	5 (3.8)
Enuresis	12 (9.2)
Others	12 (9.2)

CAKUT and CKD. Of the 34 cases of CAKUT, 12 had bladder abnormalities, while the others were vesico-ureteral reflux (VUR) in 6, ureteropelvic junction obstruction (UPJO) in 6, unilateral renal agenesis in 5, posterior urethral valve (PUV) in 2, and multicystic dysplastic kidney in 3 (Table 2). Detailed information of children with neurogenic bladder and VUR are shown in Tables 3 and 4, respectively.

Of the 6 UPJO patients, 1 was operated in Syria and his estimated GFR was 102 mL/min/1.73 m² and he had scar formation in the left kidney. Two

of the patients had right UPJO (anteroposterior diameter, 10 mm to 11 mm) and 3 had left UPJO, all of whom had a normal GFR, with no other urinary malformation or scar formation in the kidneys.

All of the children with left renal agenesis had a normal right kidney, a normal GFR, and no scar formation in the right kidney. Three multicystic dysplastic kidney patients also had a normal GFR. Two of the patients with posterior urethral valve underwent cystoscopic valve resection in our hospital. One had a normal GFR, while the other had low GFR (83 mL/min/1.73 m²).

Table 2. Etiology and Characteristics of Congenital Anomalies of the Kidney and Urinary Tract in Syrian Refugee Children

Etiology	Number of Patients	Weight Z-score	Height Z-score
Neurogenic bladder	12	-2.46	-1.88
Vesico-ureteral reflux	6	-0.52	-0.18
Ureteropelvic junction obstruction	6	-0.24	-0.18
Renal agenesis	5	-1.03	-1.68
Posterior urethral valve	2	-2.20	-1.47
Multicystic dysplastic kidney	3	+0.51	-0.21

Table 3. Detailed Information of Children With Neurogenic Bladder

Patient	Sex	Age	Consanguinity	Etiology	Radiologic Finding	Glomerular Filtration Rate, mL/min/1.73 m ²
1	Female	12 years	No	Spina bifida	Bladder trabeculation	140
2	Female	6 years	Yes	Spina bifida	Bilateral hydroureteronephrosis	95
3	Female	8 years	Yes	Spina bifida	Bilateral hydroureteronephrosis	32
4	Female	9.5 years	Yes	Spina bifida	Bilateral hydroureteronephrosis	90
5	Female	6 years	No	Spina bifida	Bilateral hydroureteronephrosis	55
6	Female	8 years	Yes	Spina bifida	Right duplicated collecting system with right-sided grade 4 vesico-ureteral reflux	94
7	Female	8 months	Yes	Anal atresia	Left sided renal pelvis anteroposterior diameter of 9 mm	140
8	Female	9 months	Yes	Anal atresia	Left sided anteroposterior diameter of 9 mm, right sided anteroposterior diameter of 8 mm	92
9	Female	4 months	No	Spina bifida	Bladder trabeculation	130
10	Female	5 months	Yes	Spina bifida	Right sided anteroposterior diameter of 8 mm	142
11	Male	3 years	Yes	Spina bifida	Bilateral hydroureteronephrosis	89
12	Male	2 years	No	Spina bifida	Bilateral hydroureteronephrosis	94

Table 4. Detailed Information of Children With Vesico-Ureteric Reflux

Patient	Sex	Age	Consanguinity	Radiologic Finding	Glomerular Filtration Rate, mL/min/1.73 m ²
1	Female	8 years	No	Right duplicated collecting system with right-sided grade 4 vesico-ureteral reflux	180
2	Female	7.5 years	Yes	Left-sided grade 4 vesico-ureteral reflux	176
3	Male	2.5 years	Yes	Bilateral grade 5 vesico-ureteral reflux	159
4	Female	4 years	Yes	Right-sided grade 4 vesico-ureteral reflux	170
5	Female	5 years	No	Right-sided grade 3 vesico-ureteral reflux	165
6	Female	8 years	Yes	Right duplicated collecting system with grade 4 vesico-ureteral reflux, left-sided grade 4 vesico-ureteral reflux	94

Twenty-four of the 130 children had NS, and consanguinity was common among them. Detailed information of the children with NS are shown in Table 5. Only 1 patient progressed to CKD, because of focal segmental sclerosis. She had dysmorphic findings, and her 2 sisters and a brother died because of NS and CKD. Further genetic evaluation of her was ongoing.

There were 4 patients with AKI. Etiologies were

Table 5. Detailed Information of Nephrotic Syndrome Patients

Characteristic	Value
Number of patients	24
Sex	
Femlae	10
Male	14
Presence of parental consanguinity	16
Weight Z-score	+0.21 (-2.48 to +2.88)
Height Z-score	-0.76 (-5.10 to +0.86)
Hypertension	
Prehypertensive	2
Stage1	3
Stage 2	4
Ultrasonography	Normal for all patients

as follows: metabolic acidosis and dehydration associated metabolic disease, hypernatremic dehydration, tubulointerstitial nephritis, and sepsis related AKI. There were 12 patients with other etiologies that included isolated proteinuria, hematuria, hypertension, and renal tubulopathy. One of these patients had kidney transplantation in Egypt. Eight children had urolithiasis. Detailed information of those children are shown in Table 6.

Overall, 43 patients had CKD, 30 of whom were at stages 4 and 5, while 3 had stage 3 CKD (1 NS and 2 neurogenic bladders), 3 had stage 2 CKD (1 PUV, 1 urolithiasis, and 1 neurogenic bladder). Seven patients had stage 1 CKD (5 neurogenic bladders, 1 PUV, and 1 VUR). Of the 30 cases of CKD, neurogenic bladder (n = 11) and unknown causes (n = 9) were the most common causes; the others were cystic renal disease (n = 4), VUR (n = 2), Joubert syndrome (n = 1), Senior-Løken syndrome (n = 1), amiloidosis (n = 1), and NS (n = 1).

Since 18 of 30 CKD patients were end-stage renal disease (ESRD) at the time of admission, dialysis programme was started. Seven children (5.3%) were

Table 6. Detailed Information of Children With Urolithiasis

Patient	Sex	Age	Consanguinity	Ultrasonography	Etiology	Therapy	Follow-up
1	Male	6 months	No	Bilateral 4- to 5-mm stone	Not found	Hydration	No
2	Male	7.5 years	Yes	Right upper 10-mm stone	Hypocitraturia	K-cystrate	Yes
3	Male	7.5 years	Yes	Midpole right kidney 9-mm stone	Hypocytraturia	K-cystrate	Yes
4	Male	6 months	Yes	Bilateral 4- to 5-mm stone	Metabolic disease	K-cystrate and eligible dietary	No
5	Female	5 years	No	Bilateral 4- to 5-mm stone	Hypocitraturia	K-cystrate	No
6	Female	7 years	No	Multiple urolithiasis	Not found	K-cystrate	No
7	Female	7 years	No	Right midpole 4- to 5-mm stone	Not found	Hydration	No
8	Female	2.5 years	No	Right 10-mm inferior pole stone	Not known*	Hydration	No
9	Female	1 years	Yes	Right 4- to 5-mm stone	Not found	Hydration	No

*Patient had a glomerular filtration rate of 72 mL/min/1.73 m². She could not be evaluated completely because she did not refer to our hospital again.

Table 7. Detailed Information of Children With Stage 4 and 5 Chronic Kidney Disease

Etiology	Number of Patient	Consanguinity	Radiologic Finding	Weight Z-score	Height Z-score
Cystic renal disease	4	4	Bilateral cystic kidneys	-1.97	-3.01
Vesico-ureteral reflux	2	1	Atrophic Kidneys	-2.60	-3.23
Nephrotic syndrome	1	1	Normal	-2.48	-4.23
Neurogenic bladder*	11	9	...	-1.41	-2.23
Unknown†	9	7	...	-1.95	-2.72
Amiloidosis	1	1	Atrophic kidneys	-3.88	-5.59
Joubert syndrome	1	1	Small, scarred, echogenic kidneys	+0.08	-1.86
Senior-Løken syndrome	1	1	Small, scarred, echogenic kidneys	+0.04	-2.20

*Two patients with neurogenic bladder had Hinman syndrome, 3 had surgery for posterior urethral valve, and 6 had other surgeries (5 for spina bifida and 1 for anal atresia).

†The Cause of cronic kideny disease was unknown in 9 of whom 5 had atrophic kidneys on ultrasonography. The other 4 children were in 2 families, brothers and sisters. Ultrasonographic findings showed loss of corticomedullary differantion in all.

on peritoneal dialysis, while 11 (8.4%) were on hemodialysis. Because of uncontrolled peritonitis, dialysis modality changed to hemodialysis in 1 patient. In the ESRD group, only 8 patients had regular follow-up visits.

DISCUSSION

Previous reports on the overall prevalence of pediatric kidney disease from Asian-African countries are scarce. The findings of this study demonstrate the increasing prevalence of kidney diseases in our environment, because of the admission of refugee children to our clinic has been increased due to ongoing war. The year 2011 was the first year of interwar in Syria, and the number of the applicants for getting medical service continues to increase day by day. Even, prevalence almost doubled over the study duration for the year of 2015.

Unfortunately, this war has been mostly affecting the children. The natural result of this event, most of chronically ill children have been admitted to the nearest safe health care services. Our team had been working hard for years to provide the most effective treatment modalities for those children. The data regarding the kidney disease profile of children in the Middle-East are limited. This study would help to share our knowledge and experiences with our colleagues in all over the world.

In recent data from Midwestern Nigeria,

Michael and colleagues found that urinary tract infection was the most common cause for kidney disease.³ Nephrotic syndrome was the 2nd and acute glomerulonephritis was the 3rd morbidity encountered. They concluded that their study had similar to results reported in their region. Ladapo and coworkers reported 320 patients with a high mortality rate. In this study NS, AKI, and nephroblastoma were the most common causes.⁴ They concluded that the study results was similar to a wide variation in disease-specific prevalence between geographic regions. The AKI and CKD groups had very high mortality rates. Another study from Saudi Arabia revealed that CAKUT and neurogenic bladder were the most common causes for CKD.⁶

We only could find 1 study from Syria.⁶ Saed reported a 1-year single center experience with 55 CKD patients. He divided the patients into 2 groups. There were 31 patients with obstructive nephropathy and 24 patients were in the nonobstructive nephropathy group.⁶ Neurogenic bladder was the most common cause for CKD in the study, accounting for 27% of all cases and 48% of the cases with obstructive nephropathy. Nonobstructive causes were found in 44% of all cases; renal hypoplasia and chronic glomerulonephritis were the two most common causes.⁶ The comparison of available data in literature is shown in Table 8.

In our study, CAKUT, CKD, and NS were the

Table 8. Comparison of Kidney Disease Profiles in Asian Countries

Characteristic	Studies on Kidney Profile				
	Lapado et al ⁴	Michael et al ³	Kari et al ⁵	Saeed ⁶	Current Study
Study Population	Sub-Saharan Africa	Nigeria	Saudi Arabia	Syria	Syria
Nephrotic syndrome	73 (22.8)	61 (31.3)	9 (13.6)	...	24 (18.5)
Congenital anomalies of the kidney and urinary tract	56 (17.5)	10 (5.8)	33 (50.0)	...	34 (26.2)
Wilms tumor	71 (22.2)	...	...	...	...
Glomerulonephritis	32 (10.0)	50 (25.6)	...	...	5 (3.8)
Urinary tract infection	10 (3.1)	82 (32.8)	...	...	...
Acute kidney injury	64 (20.0)	7 (4.1)	...	...	4 (3.1)
Chronic kidney disease	14 (4.2)	24 (12.3)	...	55	30 (23.1)
Enuresis	...	...	...	...	12 (9.2)
Urolithiasis	...	...	...	...	9 (6.9)
Nephroblastom	...	17 (16.8)	...	...	...
Other	...	4 (3.6)	...	...	12 (9.2)
Neurogenic bladder	...	...	13 (19.6)	...	...
Cortical necrosis	...	...	1 (1.5)	...	...
Hereditary conditions	...	...	8 (12)	...	...
Obstructive nephropathy	...	...	...	31 (56)	...
Non-obstructive nephropathy	...	...	...	24 (44)	...

most common causes. The findings of our study demonstrated the high prevalence of CKD in refugee children. The etiology of CKD in almost half of the patients was neurogenic bladder or unknown. In our study, the unknown causes of CKD were high (30%). We attributed those to insufficient medical records; thus, ESRD was already present at the time of first presentation in 60% of all cases. This late detection could be explained by late referral to health care centers, or coming from another country with difficult conditions because of the ongoing war, and the low socio-economic status.

The Syrian study noted that parental consanguinity was high (53%).⁶ This huge percentage can explain the wide prevalence of CKD in this series, such as neurogenic bladder, reflux nephropathy, and hereditary nephritis. We observed that consanguinity was more common but unfortunately we are not able to compare its prevalence because of incomplete data. Prenatal history could not be remembered definitely by the parents.

Female patients were predominant in all groups with CKD. In the Syrian study, 62% of patients were males.⁶ However, in ours, 63% were females. However, it is hard to compare our findings because of the heterogeneity of groups and possibility of selected patients' admissions to our clinic.

Eighteen children with ESRD were on peritoneal dialysis (7 patients) or hemodialysis (11 patients). The preference of hemodialysis was common, probably because of unsuitable living conditions. Unfortunately, only 8 patients were being visited regularly in spite of all free medical supports. We observed that a few parents accepted the disease as a fate and refused the treatment options.

CONCLUSIONS

The Syrian refugee crisis in Turkey required a fast and efficient comprehensive rescue strategy because of borders to Syria. According to the United Nations, Turkey is one of the most refugee-accepting countries in the world, and our city is one of the biggest centers for Syrian refugees to get health care. Although payments are provided

by the government, the patients and families do not admit to hospital regularly. We usually observe that they are admitted to hospital mostly in emergent situations. Sometimes, it becomes difficult to understand and solve the problems of those patients. It is remarkable that the rate of CKD among the refugee children is high. Unfortunately, this may also show that they are usually coming to hospital when the disease is in the advance stages. The importance of medical records should be remembered again, while struggling with a lot of problems of chronically ill children without any medical records and information.

CONFLICT OF INTEREST

None declared.

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